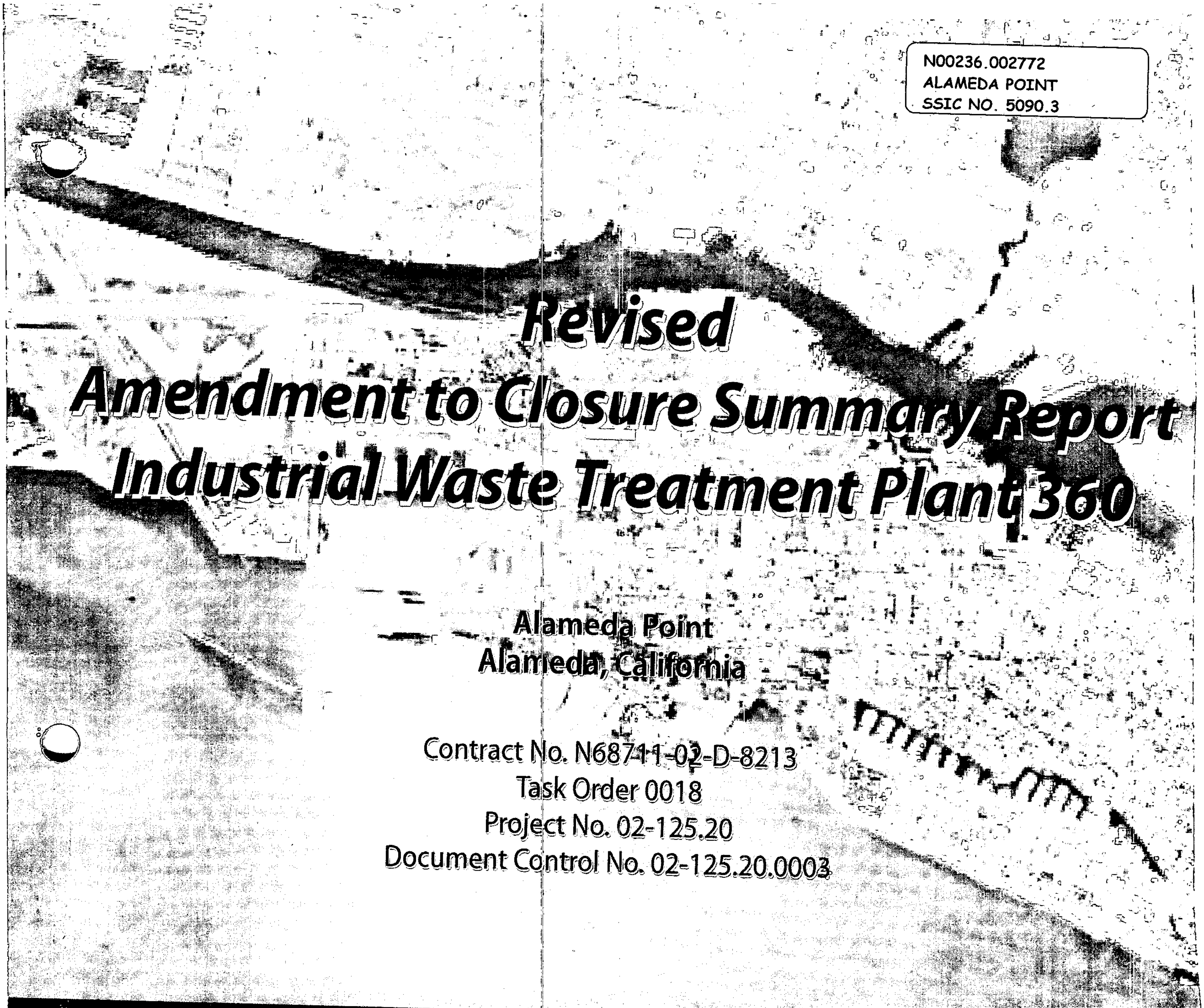

Revised
Amendment to Closure Summary Report Industrial Waste Treatment Plant 360

Alameda Point
Alameda, California

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January 2007

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SSIC NO. 5090.3

AMENDMENT TO THE CLOSURE SUMMARY REPORT

Industrial Wastewater Treatment Plant 360
Alameda Point, Alameda, California

REVISED

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ENCLOSURE

DRAFT
AMENDMENT TO CLOSURE SUMMARY REPORT
INDUSTRIAL WASTE TREATMENT PLANT 360

DATED 01 MARCH 2006

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N00236.002266

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ACRONYMS AND ABBREVIATIONS

APCL	Applied Physics and Chemistry Laboratories
bgs	below ground surface
BRAC	Base Realignment and Closure
C&T	Curtis and Tompkins, Ltd.
Cal-EPA	California Environmental Protection Agency
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
COPC	Chemicals of Potential Concern
DHS	Department of Health Services
DQO	data quality objectives
DRMO	Defense Reutilization and Marketing Office
DTSC	Department of Toxic Substances Control
E&E	Ecology and Environment, Inc.
EBS	Environmental Baseline Survey
EDAW	EDAW, Inc.
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentrations
ERA	Ecological Risk Assessment
FFA	Federal Facilities Agreement
FOD	frequency of detection
FWBZ	first water bearing zone
HHRA	Human Health Risk Assessment
HI	hazard index
ID/IQ	Indefinite Delivery/Indefinite Quantity
IDW	Investigation-derived waste
IR	Installation Restoration
IT	IT Corporation
ITSI	Innovative Technical Solutions, Inc.
IWTP	Industrial Wastewater Treatment Plant
LCS	laboratory control samples
LDC	Laboratory Data Consultants, Inc.
MCLs	Maximum Contaminant Levels
MD	matrix duplicate

ACRONYMS AND ABBREVIATIONS (Continued)

µg/dL	micrograms per deciliter
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
MCL	maximum concentration limit
MS	Matrix spikes
MSD	matrix spike duplicate
msl	mean sea level
Navy	U.S. Department of the Navy
NFEC SW	Naval Facilities Engineering Command, Southwest
OU	Operable Unit
PARCC	precision, accuracy, representativeness, completeness, and comparability
PMO	Program Management Office
ppm	parts per million
PRGs	Preliminary Remediation Goals
PRRL	project-required reporting limits
QC	quality control
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RME	reasonable maximum exposure
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SDG	sample delivery groups
SWBZ	second water bearing zone
Tetra Tech	Tetra Tech EM, Inc.
UCL_{95}	95 percent upper confidence limit

EXECUTIVE SUMMARY

On behalf of Naval Facilities Engineering Command, Southwest (NFEC SW), Innovative Technical Solutions, Inc. (ITSI) presents this amendment to the closure summary report for Industrial Wastewater Treatment Plant (IWTP) 360 at Alameda Point (formerly Alameda Naval Air Station) (Figures 1 and 2). This report has been generated by ITSI under the Indefinite Delivery/Indefinite Quantity (ID/IQ) Contract Number N68711-02-D-8213, Task Order 018.

IWTP 360 is a Part A interim status facility (CA2170023236) under the Resource Conservation and Recovery Act (RCRA); during its operation, the facility treated chromium and cyanide wastewater generated from metal plating operations in the adjacent plating shop at Building 360. This report presents the results of multiple closure confirmation sampling events and associated risk determination. The most recent (2004) sampling was conducted in accordance with the Final Amendment to the Closure Plan (Tetra Tech, 2004a) and the Sampling and Analysis Plan (SAP) (Tetra Tech, 2004b). Sampling results from the most recent as well as previous sampling events at IWTP 360 are summarized in this report and were used in conducting a Human Health Risk Assessment (HHRA). Results of a Risk Management Evaluation and Ecological Risk Assessment (ERA) are also included. The HHRA, ERA, Risk Management Evaluation, and Section 8.1 of the 2000 Federal Facilities Agreement (FFA) for the Alameda Naval Air Station (which defers further corrective action under RCRA) will provide sufficient documentation to support clean closure of IWTP 360 by California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC).

The plans and documents submitted and removal actions conducted are summarized below:

- In 1988, the initial closure plan for the Building 360 IWTP was generated (U.S. Department of the Navy [Navy], 1988).
- In 1990, the Navy prepared a revised closure plan (Navy, 1990) in anticipation of the Navy's intention to transfer the wastewater treatment to an alternate IWTP. However, the facility was not taken out of service at that time.
- In 1994, operations ceased at IWTP 360 and the tanks, pumps, and piping at the facility were emptied of all fluids.
- In 1995, the Navy submitted another revised closure plan recommending decontamination and confirmation sampling activities (Ecology and Environment, Inc. [E&E], 1995). Additional soil and groundwater sampling required to fully

characterize the site were deferred to the investigation of the surrounding Installation Restoration (IR) Site 4 being performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). DTSC approved the 1995 closure plan. IWTP360 is within the IR Site 4 area which is subsequently within the IR Site 3 area. The IR Site 4 and 3 areas are referred to as the IR Site 3 Group.

- Between 1996 and 2000, IWTP 360 was completely demolished and disposed of off site in a series of closure activities, pursuant to the approved 1995 closure plan. Many of the actual closure activities conducted for the IWTP, however, were more extensive than specified in the plan.
- In 1997, the Navy summarized its initial closure activities in a closure summary report (E&E, 1997). Based on the sampling results presented in the closure summary report, DTSC requested additional investigation of cadmium and chromium contamination in soil near the sumps.
- In 2000, the Navy addressed DTSC comments by submitting a Field Sampling Investigation Plan (Navy, 2000) which proposed sampling to investigate the extent of metals in soil. DTSC approved this plan (DTSC, 2000) and sampling was conducted.
- In a meeting in 2000, the Navy and DTSC agreed on the extent of metals-impacted soil to be excavated based on the sampling data; the Navy subsequently (in December 2000) removed the concrete pad and sumps and excavated the impacted soil to the agreed-upon limits, thereby removing the contaminant source at the site.
- A FFA for Alameda Naval Air Station was negotiated between the Navy, DTSC, EPA, and RWQCB, and signed in 2000. This agreement identifies that, under Section 8.1 of the FFA, remedial actions completed under the FFA will "obviate the need for further corrective action under RCRA."
- In 2001, the Navy submitted an Addendum to the Closure Summary Report (IT Corporation [IT], 2001b) summarizing the removal activities and a third party Certification Report for Closure. DTSC comments and Navy responses were documented in the minutes from meetings in June and August, 2001.
- In a 2002 letter, DTSC did not provide approval for closure at IWTP 360 and requested additional soil and groundwater sampling near the former unit as well as along the waste pipelines that connected the former unit to Building 360 (DTSC, 2002).
- In 2004, the Navy submitted an amendment to the closure plan and a SAP (Tetra Tech, 2004a and 2004b) to supplement the previous sampling and provide adequate delineation of site-related contaminants; both documents were approved by DTSC in February 2004. Sampling activities were conducted in March 2004.
- This 2006 amendment to the closure summary report presents the results of the 2004 sampling and associated risk assessment, and summarizes the previous sampling.

The cumulative results from the 2004 investigation and previous investigations have adequately characterized the soil and groundwater conditions of the former IWTP 360 and along the underground pipelines between Building 360 and IWTP 360. Previous investigations included the following sampling events:

- 1995: Four soil and one groundwater sample from three IWTP 360 locations
- 1997: 21 soil samples from seven IWTP 360 locations
- 1999/2000: 100 soil samples from 20 IWTP 360 locations
- 2001: Three groundwater samples from one IWTP 360 location
- 2002: Five soil and two groundwater samples from three pipeline locations
- 2004: Six soil and six groundwater samples from five IWTP 360 locations and 11 soil and three groundwater samples from six pipeline locations

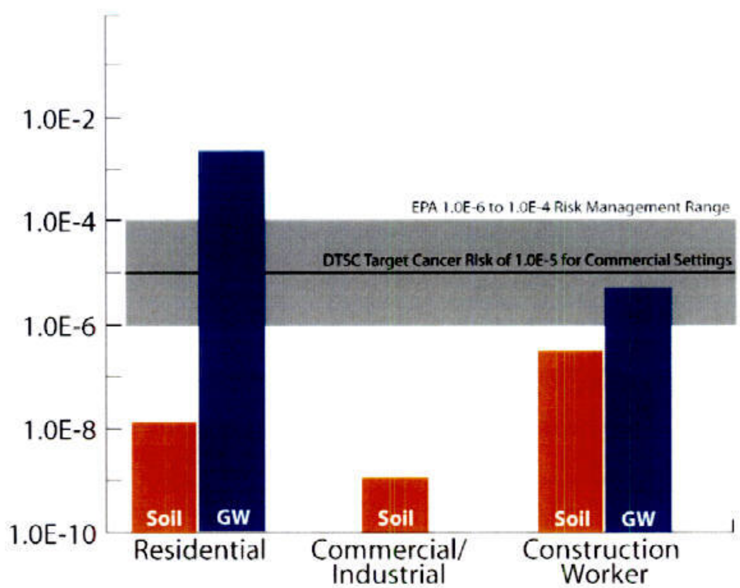
An evaluation of the metals results for soil and groundwater samples collected from the site and representing soils remaining at the site (not previously removed as part of previous excavation activities) was performed to ascertain which metals represented potential releases from historic operations at IWTP 360, and which represented ambient background conditions found in the soils present throughout Alameda Point. The result of this evaluation was a list of chemicals of potential concern (COPC) for both soil and groundwater. These COPCs were used in the HHRA to understand potential risk from historic operations of IWTP 360.

Carcinogenic risk and non-carcinogenic health effects from the COPCs in soil and groundwater were calculated in the HHRA using DTSC criteria. In order to determine if IWTP 360 can be released for unrestricted use after closure, carcinogenic risk and non-carcinogenic health effects were calculated for a hypothetical future residential population, even though the proposed reuse for the IWTP 360 vicinity is commercial/industrial according to the Preliminary Development Concept (Roma Design Group, 2006). Carcinogenic risk and non-carcinogenic health effects were also calculated for a hypothetical future commercial/industrial population, and for hypothetical future construction worker population.

For the hypothetical future residential scenario, carcinogenic risk and non-carcinogenic health effects were evaluated based on exposure to COPCs in soil and groundwater. For the hypothetical future commercial/industrial scenario, risks and health effects were evaluated for soil only. For the hypothetical future construction worker scenario, risks and health effects were evaluated for soil and groundwater. Specific pathways that were evaluated in the HHRA included:

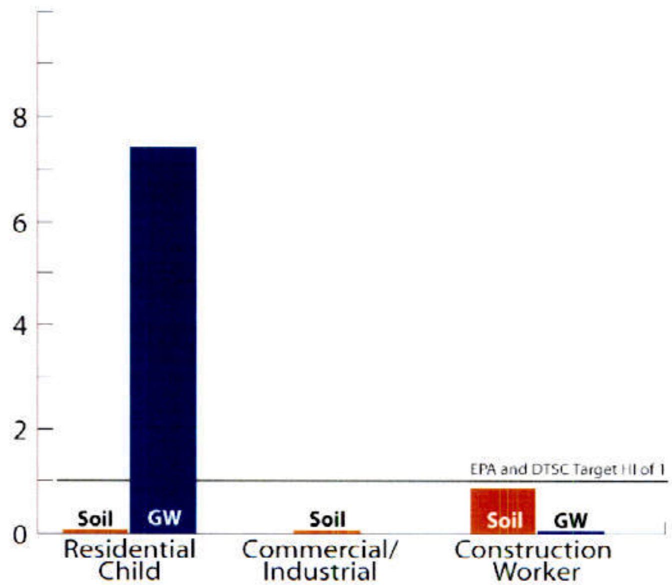
- Exposure to metals in soil via ingestion, dermal contact, and inhalation of fugitive dust for hypothetical future residential, commercial/industrial, and construction worker populations;
- Exposure to metals in groundwater via ingestion and dermal contact for hypothetical future residential and construction worker populations.

Using the pathways and receptors noted above, **site** risks and hazards, **background** risks and hazards, and **incremental** risks and hazards (estimated by subtracting the background risk from the site risk) were calculated for each receptor.



As shown graphically above, site carcinogenic risks from COPCs in soil for all three hypothetical future populations are well below both EPA's risk management range of 10^{-4} to 10^{-6} and DTSC's target cancer risk (10^{-6} for residential land-use settings and 10^{-5} for construction workers). However, site carcinogenic risk from groundwater is above both EPA's risk management range and DTSC's target risk for future hypothetical residents. The risk is directly attributable to ingestion of arsenic in groundwater. Site carcinogenic risks from groundwater

COPCs for hypothetical future construction workers are below EPA's risk management range and DTSC's target risk for commercial settings.



As shown graphically above, non-carcinogenic hazard indices (HI's) from COPCs in soil for all three hypothetical future populations are well below EPA's and DTSC's target HI of 1. However, site HI from COPCs in groundwater for future hypothetical residents (in this case, the residential child, the most sensitive receptor) is above EPA's and DTSC's target HI. The HI is directly attributable to the potential adverse health effects from ingestion of arsenic and vanadium in groundwater. Site HI from COPCs in groundwater for the hypothetical future construction worker population is below EPA's and DTSC's target HI of 1.

Additional details on the results of the HHRA are provided in Section 8 of this report, including a discussion of carcinogenic risk and non-carcinogenic HIs for soil and groundwater for each future scenario.

An ERA was also conducted for IR Sites 3, 4, 11, and 21 as part of the CERCLA program for operable unit (OU) 2B (see Appendix D). As mentioned earlier, IWTP 360 is located within the IR Site 3 Group that includes both IR Sites 3 and 4. A separate ERA was not conducted specifically for IWTP 360, but the OU 2B ERA included smaller IR Site 4 area with the same ecological receptors. These results indicate a potential risk to small mammals and raptors from lead (a COPC for IWTP 360), of passerines and raptors from silver (a COPC for IWTP 360), and of mammals from copper (not a COPC for IWTP 360) and silver. However, the risk of exposure to these chemicals was determined to be low based on the lack of habitat for these receptor populations in the area. For groundwater within the OU-2B plume, manganese (not a COPC for IWTP 360) may present a risk to marine receptors. However, this risk is also expected to be low (IWTP360 is located over 1,000 feet east of Seaplane Lagoon).

DTSC's Permit Writers Manual (DTSC, 2001) states that final goals for risk based clean closure are set by a risk management process that includes consideration of cost, benefit, feasibility, permanence, community acceptance, and acceptance by other agencies, in addition to risk (DTSC, 2001).

A risk management evaluation was conducted for the residential scenario to address the hypothetical carcinogenic risk and non-carcinogenic hazard in excess of target levels via ingestion of metals in groundwater. As discussed below, no actual exposures are expected to occur and any hypothetical risks associated with unrestricted use will be addressed under CERCLA. The shallow aquifer at IWTP 360 will not be used as a domestic drinking water source in the future. No drinking water wells currently exist at the site, and the proposed future land use is commercial/industrial (Roma Design Group, 2006).

If water supply wells were installed in the shallow water-bearing zone, problems would include insufficient yield, possible saltwater intrusion, and the potential influx of contaminants from adjacent plumes. Contaminant plumes unrelated to IWTP 360 exist in groundwater associated with IR Site 3Group (a CERCLA site), which wholly encompasses IWTP 360. In order for IR Site 3 Group to be released for unrestricted use under CERCLA, risks and health hazards associated with the hypothetical use of groundwater will be addressed through some combination of remedial activities, land-use controls, institutional controls, or other CERCLA actions, regardless of the status of this smaller RCRA site. Such actions instituted for IR Site 3 Group under CERCLA would address the hypothetical risks and health hazards for IWTP 360.

(CERCLA decisions are outside the scope of this document, but will be administered within the scope of the CERCLA process.)

Based on the results of the investigations to date and the results of the HHRA, the Navy proposes no further investigation or cleanup actions for soil at IWTP 360. In addition, consistent with the 2000 FFA, the Navy proposes that groundwater contamination present at IR Site 3 Group, including impacted groundwater immediately beneath IWTP 360 (located entirely within the IR Site 3 Group), be addressed under the current CERCLA action.

Based on the findings detailed in this closure report, the Navy recommends RCRA clean closure at IWTP 360. The Navy will submit closure certification to DTSC from both the Director of the Base Realignment and Closure (BRAC) Program Management Office (PMO) West and an independent California-registered professional engineer.

1.0 INTRODUCTION

On behalf of Naval Facilities Engineering Command, Southwest (NFEC SW), Innovative Technical Solutions, Inc. (ITSI) presents this amendment to the closure summary report for Industrial Wastewater Treatment Plant (IWTP) 360 at Alameda Point. See Figure 1 and Figure 2 for the general location and the outline of Alameda Point, respectively. This report has been generated by ITSI under the Indefinite Delivery/Indefinite Quantity (ID/IQ) Contract Number N68711-02-D-8213, Task Order 018.

IWTP 360 is a Part A interim status facility (CA2170023236) under the Resource Conservation and Recovery Act (RCRA) added to the Interim Status Document in October 1987; during its operation, the facility treated chromium and cyanide wastewater generated from metal plating operations in the adjacent plating shop at Building 360. Wastewater was transmitted to the facility from Building 360 via a system of subsurface pipelines.

The sample results presented in this summary report were used in conducting the HHRA. The results of the HHRA and the associated risk management evaluation, in turn, provide adequate documentation to support approval for closure under RCRA by the California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC).

1.1 PURPOSE

This report's primary purpose is to present the results of the various closure confirmation sampling events and the associated risk determination. The most recent (March 2004) sampling was conducted in order to address DTSC comments on previous closure documents, in particular, on the closure certification report for IWTP 360 (Tetra Tech, 2001); work was performed in accordance with the approved Final Amendment to the Closure Plan (Tetra Tech, 2004a) and the Sampling and Analysis Plan (SAP) (Tetra Tech, 2004b). Sampling results from the most recent as well as previous sampling events at IWTP 360 are summarized in this report and were used in conducting an HHRA, a risk management evaluation, and an Ecological Risk Assessment (ERA).

Based on DTSC comments to the Draft version of this report, soil and groundwater background concentrations were re-evaluated and risk numbers originally presented in the HHRA and the Technical Memorandum to the HHRA have been re-calculated and re-evaluated. Appendix A presents the analytical results; Appendix B provides the revised background concentrations for soil and groundwater; the revised Technical Memorandum to the HHRA is included as Appendix C [note that based on comments from DTSC, the original HHRA presented in the Draft Amendment to Closure Summary Report (ITSI, 2006) is not attached in this version]. Appendix D presents the ERA conducted for Installation Restoration (IR) Sites 3, 4 (which includes IWTP 360), 11, and 21 prepared as part of the remedial investigation for Operable Unit (OU) 2B. The conclusions presented in this report are based on the sampling, assessments (particularly the HHRA), and evaluations presented herein and provide documentation that IWTP 360 meets the closure performance standards established in the approved Amendment to the Closure Plan (Tetra Tech, 2004a).

1.2 DATA QUALITY OBJECTIVES

The most recent soil and groundwater sampling, March 2004, was conducted in accordance with the data quality objectives (DQOs) specified in the approved SAP (Tetra Tech, 2004b). The DQOs are listed in Table 1.

1.3 CLOSURE PERFORMANCE STANDARDS

Soil and groundwater closure performance standards for IWTP 360 are listed in the approved Amendment to the Closure Plan (Tetra Tech, 2004a). Concentrations of metals in soil and groundwater were compared statistically to the Alameda Point background levels, as appropriate. In addition, U.S. Environmental Protection Agency (EPA) Region 9 Preliminary Remediation Goals (PRGs) (EPA, 2002) (or the California-modified PRGs, when available) for soil results and California Maximum Contaminant Levels (MCLs) (California Department of Health Services [DHS], 2003) for groundwater results were used as screening tools; however, quantitative human health and ecological risk assessments were completed to make risk management decisions for closure.

2.0 HISTORY, BACKGROUND AND SETTING

This section outlines the activities conducted at IWTP 360 during its 21 years of operation, including the facility's regulatory history, design, and operational history, closure activities, physical setting, and planned land reuse.

2.1 FACILITY DESIGN AND OPERATIONAL HISTORY

IWTP 360 was constructed in 1973, taken out of service in 1994, and completely demolished by 2000. During its operation, IWTP 360 treated chromium and cyanide wastewater generated from metal plating operations in the plating shop within Building 360. IWTP 360 was located inside a roofed, fenced enclosure west of Building 414. The facility was constructed on a continuously poured concrete slab bordered by a concrete curb with a total secondary containment capacity of 48,000 gallons. Detailed information regarding operation of this facility is included in the 1995 closure plan (Ecology and Environment, Inc. [E&E], 1995).

Processes conducted in the plating shop of Building 360 included chrome, nickel, lead, tin, silver, and copper plating. The plating operations in Building 360 were divided into dedicated to cyanide and chromium processing areas. The wastewater from the cyanide process contained cyanide (4 parts per million [ppm]), nickel (6 ppm), and total solids (210 ppm) at pH levels near 8. Chromium wastewater contained total chromium (40 ppm) and total solids (300 ppm) at a pH of about 9 (E&E, 1983).

Wastewater from the plating shop in Building 360 was transferred to the former IWTP 360 via underground iron and clay piping. The pipelines within Building 360 were above ground, located under a raised floor. The IWTP facility included 10 aboveground storage tanks and three underground sumps (Figure 3).

Hazardous wastes managed at IWTP 360 included the following constituents (E&E, 1995):

- Cadmium
- Chromium (total and hexavalent)
- Copper
- Cyanide

- Lead
- Metal hydroxide sludge
- Nickel
- Silver
- Surfactants

2.2 REGULATORY HISTORY

In July 1987, the U.S. Department of the Navy (Navy) submitted a revised RCRA Part A permit application to add IWTP 360 to the Interim Status Document. DTSC approved the Part A revision to include IWTP 360 in October 1987. Navy prepared an initial closure plan for IWTP 360 in 1988 (Navy, 1988), but operations did not cease until 1994. The plans and documents submitted and removal actions conducted are summarized below:

- In 1988, the initial closure plan for the Building 360 IWTP was generated (Navy, 1988).
- In 1990, the Navy prepared a revised closure plan (Navy, 1990) in anticipation of the Navy's intention to transfer the wastewater treatment to an alternate IWTP. However, the facility was not taken out of service at that time.
- In 1994, operations ceased at IWTP 360 and the tanks, pumps, and piping at the facility were emptied of all fluids.
- In 1995, the Navy submitted another revised closure plan recommending decontamination and confirmation sampling activities (E&E, 1995). Any additional soil and groundwater sampling required to fully characterize the site were deferred to the investigation of the surrounding IR Site 4 being performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). DTSC approved the 1995 closure plan.
- Between 1996 and 2000, IWTP 360 was completely demolished and disposed of off site in a series of closure activities, pursuant to the approved 1995 closure plan. Many of the actual closure activities conducted for the IWTP, however, were more extensive than specified in the plan.
- In 1997, the Navy summarized its initial closure activities in a closure summary report (E&E, 1997) and submitted additional revised pages in 1998. Based on the sampling results presented in the closure summary report, DTSC requested additional investigation of cadmium and chromium contamination in soil near the sumps.
- In 2000, the Navy addressed DTSC comments by submitting a Field Sampling Investigation Plan (Navy, 2000) which proposed sampling to investigate the extent of metals in soil. DTSC approved this plan, and sampling was conducted.

- In a meeting in 2000, the Navy and DTSC agreed on the extent of metals-impacted soil to be excavated based on the sampling data; the Navy subsequently (in December 2000) removed the concrete pad and sumps and excavated the soil to the agreed-upon limits.
- In 2001, the Navy submitted an Addendum to the Closure Summary Report (IT Corporation [IT], 2001) summarizing the removal activities and a third party Certification Report for Closure. DTSC comments and Navy responses were documented in the minutes from meetings in June and August, 2001.
- In a 2002 letter, DTSC did not provide approval for closure at IWTP 360 and requested additional soil and groundwater sampling near the former unit as well as along the waste pipelines that connected the former unit to Building 360 (DTSC, 2002). The Navy responses were also documented in a letter.
- In 2004, the Navy submitted an amendment to the closure plan and a SAP (Tetra Tech, 2004a and 2004b) to supplement the previous sampling and provide adequate delineation of site-related contaminants; both documents were approved by DTSC in February 2004 (DTSC, 2004). Sampling activities were conducted in March 2004.
- This 2006 amendment to the closure summary report presents the results of the 2004 sampling and associated risk assessment, and summarizes the previous sampling.

In addition to requiring that the Navy conduct additional sampling to delineate contamination related to IWTP 360, DTSC also requested in 2002 that the Navy determine whether RCRA-related activities contributed to contamination in the vicinity of the plating shop. This area was not discussed in the 1995 closure plan because it is physically separated from IWTP 360. Based on discussions with DTSC, the Navy also added closure performance standards for soil and groundwater to the 2004 closure plan document.

2.3 DECONTAMINATION AND REMOVAL ACTIVITIES

All tanks, structures, concrete pads, underground sumps, and aboveground piping have been removed from IWTP 360. Two major decontamination and removal activities were conducted after IWTP 360 was taken out of service in 1994.

Between September 1996 and February 1997, aboveground tanks and other components were decontaminated and demolished (E&E, 1997) and confirmation samples were collected. After decontamination, all tanks, piping, and equipment inside the secondary containment area within the fenced enclosure for IWTP 360 were transported to the Defense Reutilization and Marketing

Office (DRMO) for reuse and/or recycling. The underground chromium sump and cyanide sump were filled with gravel and capped with wet cement.

Between August and December 2000, a concrete pad and two underground sumps that had been filled in 1997 were demolished and removed, and the soil was excavated (IT, 2001b). The concrete pad that formerly served as the floor of the secondary containment system for the aboveground tanks was broken up and disposed of off site at a permitted Class II facility (IT, 2001b). The sumps were found to extend to depths of 12 feet below ground surface (bgs). Cadmium- and chromium-contaminated soil was excavated from the area around the two sumps to depths ranging from 10 to 12 feet bgs. The soil removal area extended south from locations beneath the southern end of the former concrete pad used as the secondary containment element of IWTP 360. A sheet pile barrier was installed between the east end of the planned excavation area and Building 414 to maintain the integrity of Building 414 (IT, 2001b). The excavated soils were transported off site to a Class I disposal facility, and the excavation was backfilled with drain rock and clean fill. After the backfilling, the excavation area and adjacent damaged pavement were repaved with asphalt. The soil removal activities are detailed in the final field sampling investigation for IWTP 360 (IT, 2001b).

Approximately 220 linear feet of subsurface pipelines occur at the site. The pipelines were flushed before IWTP 360 was taken out of service. Underground clay pipes previously connected to the chromium and cyanide sumps were removed from the point of connection to the southern extent of the excavation. The remaining clay piping connected to the cast iron piping from Building 360 was left in place.

A concrete surface supported by vertical wood timbers resembling remnants of an old pier was observed at the southern end of the excavation and was left in place (IT, 2001b).

2.4 SITE SETTING

This section presents the general site setting, including topography, hydrogeologic, and weather and climactic conditions.

2.4.1 Topography

Alameda Point is located on the western tip of the Island of Alameda, along the eastern margin of the San Francisco Bay, adjacent to the city of Oakland (Figure 1). The northern portion of what is now Alameda was formerly tidelands, marshlands, and sloughs, adjacent to the historical San Antonio Channel, now known as the Oakland Inner Harbor. Most of the land that is now Alameda Point was created by filling the natural tidelands, marshlands, sloughs, and subtidal areas with dredge spoils from the surrounding San Francisco Bay, Seaplane Lagoon, and Oakland Inner Harbor.

The onshore portion of Alameda Point is a 1,734-acre area about 2 miles long from east to west and 1 mile wide from north to south. The land surface is low-lying and nearly flat. Elevations throughout the area are less than 15 feet (5 meters) above mean sea level (msl).

IWTP 360 is located on the eastern side of the Seaplane Lagoon within IR Site 4 (a CERCLA site), west of Building 360 (Figure 2). The area surrounding IWTP 360 is covered with asphalt.

2.4.2 Hydrogeologic Conditions

In general, groundwater in the vicinity of IWTP 360 flows in a west-northwest direction. One monitoring well, M04-05, is located about 20 feet west of Building 360 and about 20 feet north of the wastewater pipelines running from Building 360 to IWTP 360 (Figure 4). Groundwater beneath the site is encountered at a depth of 5 to 7 feet bgs.

2.4.3 Weather and Climactic Conditions

The prevailing winds of the San Francisco Bay Area are from the west. Records show that winds of gale force or greater have occurred only rarely in the area. Heavy fogs occur on the average of 21 days per year. These fogs impair visibility for navigation at nearby Oakland Airport an average of less than 100 hours per year. Freezing temperatures rarely occur, and snow or icing conditions are rarely encountered. Rainfall averages about 20 inches annually, generally occurring between the months of October to May (E&E, 1983).

2.5 PLANNED REUSE

Future land use categories and land use areas for Alameda Point were identified in the Naval Air Station Alameda Community Reuse Plan (EDAW, Inc. [EDAW], 1996) and have been updated in the Preliminary Development Concept (Roma Design Group, 2006). The planned reuse for the area around IWTP 360 is commercial/industrial and is characterized by a combination of industrial, open space, and community support uses.

3.0 SUMMARY OF PREVIOUS INVESTIGATIONS

In addition to the recent investigation and sampling conducted in March 2004, the Navy conducted four previous investigations at IWTP 360, which are documented in the following reports:

- Closure Summary Report (E&E, 1997)
- Environmental Baseline Survey (EBS) (IT, 2001a) (sampling consisted of two phases, one in 1995 and one in 1999)
- Field Sampling Investigation Report (Addendum to the 1997 Closure Summary Report) (IT, 2001b)
- Data Summary Report, Supplemental Remedial Investigation Data Gap Sampling for Operable Units 1 and 2 (Tetra Tech, 2002)

The first three of these investigations were conducted in the vicinity of IWTP 360, while the Data Gap Sampling was conducted both at the former treatment plant and along the subsurface pipelines extending between Building 360 and IWTP 360. Investigation sample information, including analyses conducted, are listed in Table 2 for the samples collected in the vicinity of IWTP 360 and in Table 3 for the samples collected along the pipelines; sample results are included in Appendix A. Field investigation documentation for these events is included in Appendix E (data validation reports and chain of custody forms) and F (boring logs, daily field reports, photographs of the field work, and manifests for investigation derived waste). The following subsections summarize the investigation results at each of these locations.

3.1 INVESTIGATIONS CONDUCTED IN THE VICINITY OF IWTP 360

Samples were collected in the vicinity of IWTP 360 during four separate investigations; sampling locations are shown on Figure 3.

In 1995, as part of the first phase of the EBS, four samples were collected from two boring locations inside Building 414 at depths ranging from 2 to 4.5 feet bgs; groundwater was collected in 1999 from one sampling location east of Building 414 and west of UST 164-1 (IT, 2001a). In 1997, E&E collected 26 soil samples from seven boring locations at depths ranging from 1 to 10 feet bgs. Three to four samples were collected from most borings; only one sample was collected from Boring B3, however, due to drilling refusal at 1 foot bgs (E&E, 1997). The soil samples were analyzed for metals, phenols, chlorinated hydrocarbons, cyanide, and total recoverable petroleum hydrocarbons. With the exception of cadmium and chromium, all analytes were either not detected or were detected at concentrations less than the residential PRGs (EPA, 2002) or the background levels of metals at Alameda Point (Appendix B).

In 2000, IT collected one hundred soil samples from 20 boring locations at depths ranging from 6 to 14.6 feet bgs. Based on the results of the 1997 E&E sampling, the soil samples collected in 2000 were only analyzed for chromium and cadmium, both of which were also detected during the 2000 sampling event at concentrations in excess of the residential PRGs. All soil with detected concentrations of cadmium exceeding the residential PRG was excavated in December 2000. Soil with known concentrations of total chromium exceeding the residential PRG was excavated to a depth of 10 feet bgs. The excavation footprint is shown on Figure 3; soil in the vicinity of borings IWTP 360-1 through -7 and E&E borings B3 and B4 was removed. In 2001, Tetra Tech collected groundwater from two depths (7 feet bgs and 12 feet bgs) at one sampling location south of the former excavation area (and south of the former sumps) (Tetra Tech, 2002). Detected concentrations of cadmium or chromium in groundwater were less than the California MCLs (DHS, 2003).

3.2 INVESTIGATIONS CONDUCTED ALONG PIPELINES FROM BUILDING 360 TO IWTP 360

In 2002, during the supplemental remedial investigation (RI) data gap sampling, soil and groundwater samples were collected along the underground pipelines that extend from Building 360 to IWTP 360 (Tetra Tech, 2002). Ten soil samples were collected from three vacuum excavation borings at the following locations: adjacent to Building 360, midway between Building 360 and IWTP 360, and south of the former IWTP sumps (Figure 4). Detected concentrations in these soil samples were less than residential PRGs for the identified metals of concern (cadmium, chromium, copper, lead, nickel, and silver).

Total cyanide was detected in soil samples collected in the vicinity of IWTP 360 and along the pipelines; concentrations ranged from non-detect to a maximum value of 2.5 milligrams per kilogram (mg/kg). The EPA Region 9 residential PRG for cyanide (free) in soil is 1,200 mg/kg

(EPA, 2002); therefore, the approved closure plan for IWTP 360 did not propose further sampling for cyanide (Tetra Tech 2004a).

Groundwater samples were also collected from two of the soil sampling locations along the underground pipelines (Figure 4). Detected concentrations for the metals of concern (cadmium, chromium, copper, lead, nickel, and silver) were less than the MCLs. However, groundwater sampling results from a nearby monitoring well (M04-05, shown on Figure 4) located north of the pipelines and west of Building 360 has consistently exhibited concentrations of total chromium greater than the California drinking water MCL of 50 micrograms per liter (μg/L) (DHS, 2003).

4.0 SUMMARY OF RECENT INVESTIGATION ACTIVITIES

The following sections present the results of the recent (2004) investigation activities, including pre-investigation, investigation, and post-investigation activities conducted at the site during the 2004 closure confirmation investigation. The two subsequent sections describe deviations from the SAP, and an assessment of data quality, respectively.

4.1 PRE-INVESTIGATION ACTIVITIES

Before the commencement of the March 2004 field investigation activities, a pre-investigation site visit was conducted to identify and address any potential access issues and to conduct utility clearance around each of the proposed boring locations.

The two buildings in the vicinity of former IWTP 360 (Buildings 414 and 163A) and the fenced yard between the buildings is currently leased by tenants through the City of Alameda. The tenants were notified during the pre-investigation site visit of the planned work schedule and of areas inside the fenced yard that would need to be cleared for equipment access.

An underground utility survey was conducted to clear all boring locations prior to implementing intrusive field activities. No underground utilities were identified that required relocation of the proposed locations.

Due to the presence of a large quantity of immovable tenant property along the northern wall of Building 163A, one vacuum excavation location originally proposed at the northeast corner of Building 163 was relocated approximately 7 feet east of its originally proposed location, to a position outside the fenced area between Buildings 163A and 414 (actual locations are shown on Figure 3).

4.2 INVESTIGATION ACTIVITIES

The March 2004 investigation activities proposed in the approved planning documents were designed to satisfy the DQO (presented in Table 1), which were developed to address the comments provided by DTSC (DTSC, 2002) on the previous closure certification report for IWTP 360. DQOs are qualitative and quantitative statements developed through the seven-step DQO process in accordance with EPA guidance (EPA 2000a, 2000b). The DQOs are intended to clarify the study objective, define the most appropriate data to collect and the conditions under which to collect the data, and specify tolerable limits on decision errors that will be used as the basis for establishing the quantity and quality of data needed to support decision-making. The end result of the DQO process is to develop a scientific and resource-effective design for sample collection.

The following sections detail field investigation activities implemented in the vicinity of IWTP 360 and along the adjacent pipelines. Field investigation activities occurred between March 3rd and 5th, 2004.

4.2.1 Vicinity of IWTP 360

Four soil samples were collected from two boring locations in the vicinity of IWTP 360 using direct-push drilling methodology (locations are shown on Figure 3; sampling information is presented on Table 4). Shallow soil samples were collected at 1.5 to 2 feet bgs and groundwater interface soil samples were collected at 4.5 to 5 feet bgs. Samples were intended to delineate the lateral extent of soil contamination east of IWTP 360, beyond the limits of the excavated area. Five groundwater samples were collected from three direct-push boring using a HydroPunch® sampling rod. Shallow groundwater samples were collected at IWTP-DP02, -DP03, and -DP04 at the groundwater interface, at approximately 5 feet bgs. Deeper groundwater samples were collected at -DP02 from 10 to 12 feet bgs, and -DP03 at 8 to 10 feet bgs. Borings -DP03 and -DP04, were located along the north and northwestern edge of the excavated area within the former IWTP and -DP02 was located along the eastern border of the excavated area (Figure 3). One groundwater sample was also collected in 2002 to the south of the excavated area (boring S04-DGS-DP21).

After several attempts at collecting a deep groundwater sample using HydroPunch® failed at -DP04 due to very slow aquifer recharge, a temporary well screen was inserted to a depth of 10 feet bgs. The temporary well screen did not yield sufficient groundwater volume for the analytical method requirements; therefore, no deep groundwater sample was collected from this location.

Soil and groundwater samples were analyzed for Contract Laboratory Program (CLP) metals by Applied Physics and Chemistry Laboratories (APCL) of Chino, California and hexavalent chromium by Curtis and Tompkins, Ltd. (C&T) of Emeryville, California.

4.2.2 Pipelines from Building 360 to IWTP 360

Eleven soil samples and three groundwater samples were collected from six vacuum excavation locations along the pipelines that run from Building 360 to IWTP 360 (Figure 4) Sampling information is presented on Table 5. Two soil samples and one groundwater sample were also collected from a direct-push sampling location at the northwestern end of the pipelines (just south of the excavated area within the former IWTP). One shallow soil sample was collected at each vacuum excavation sampling location at the same depth as the pipelines, generally around 3 feet bgs, and another soil sample was collected slightly deeper, below the pipeline at approximately 5 feet bgs. Groundwater samples were collected at three sampling locations, at approximately 8 feet bgs. The objective of the selection of these sampling locations was to evaluate whether soil or groundwater contamination resulted from possible leaks from the underground pipelines.

Six soil and groundwater sampling locations were proposed in the SAP along the clay pipes that run from Building 360, east of the former IWTP 360. To protect the clay pipes from damage that could be caused by a conventional drill rig, a vacuum excavation rig was used to advance an opening into the ground. A hole is created by loosening the soil with a high pressure, concentrated blast of air, and subsequently using a vacuum excavator to suck the loosened material into a hose for containerization and eventual disposal. Once the opening was advanced to the desired depth (the depth of the pipeline and two feet below the pipeline), a hand driven core sampler was used to collect soil samples. Groundwater samples were collected at the groundwater interface using temporary well screen that was placed into the hole or a hydraulically driven HydroPunch® sampler.

At locations IWTP360-VE01 and -VE02, an obstruction was encountered at approximately 4.5 feet bgs. It appeared to be the pier-type structure noted by IT during the removal action conducted in 2000 (Section 2.3). Several attempts were made to widen the openings made by the vacuum excavation nozzle; however, the obstruction extended laterally beyond the reach of the excavation nozzle. Shallow soil samples were collected at both sampling locations at intervals from 3 to 3.5 feet bgs, and a deeper soil sample was collected at -VE01 at an interval from 4 to 4.5 feet bgs. Groundwater was not encountered at these locations.

While advancing the hole at sampling location IWTP360-VE03 (Figure 4), a yellow plastic-coated pipe approximately 2 inches in diameter was encountered. The pipe appeared to be a natural gas line. The opening was terminated. A new opening was advanced approximately 7 feet to the east. Soil samples were collected from this location at intervals of 2.5 to 3.0 and 4.2 to 4.8 feet bgs. A groundwater sample was collected from a temporary well screen from 7 to 9 feet bgs.

The three additional vacuum excavation holes advanced along the underground pipes were IWTP360-VE04 through -VE06. Shallow and deep soil samples were collected at each location. Shallow and deep soil samples were collected from -VE04 at intervals from 3 to 3.5 feet bgs and from 4 to 4.5 feet bgs, respectively. Shallow and deep soil samples were collected from vacuum excavation locations -VE05 and -VE06 at intervals from 2.5 to 3 feet bgs and 4.5 to 5 feet bgs, respectively. Groundwater samples were collected from VE04 and VE06 using a HydroPunch® sampler screened from 8 to 10 feet bgs. A duplicate groundwater sample was collected at -VE06. No groundwater sample was collected from IWTP360-VE05 because of slow groundwater recharge which did not yield sufficient volume for sampling.

One direct-push sampling location (IWTP360-DP05) was advanced near the northwestern end of the pipelines to provide additional data because of the refusals encountered at IWTP360-VE01 and VE02. One shallow soil sample was collected 1.5 to 2 feet bgs, and another was collected from below the pipes at an interval of 4.5 to 5 feet bgs. A HydroPunch® groundwater sample was collected at 8 to 10 feet bgs.

4.3 POST-INVESTIGATION ACTIVITIES

Post-sampling activities included disposal of investigation derived waste (IDW) and surveying of boring locations. Immediately following completion of sampling activities, IDW, consisting of soil cuttings and decontamination water, was staged in drums at the Shaw Environmental, Inc., field office located at 399 W. Seaplane Lagoon. IDW was later removed from that location by a licensed waste hauler in accordance with all applicable regulations. Surveying of boring locations was performed on March 9, 2004, by Geotopo, Inc. of Oakland, California.

4.4 DEVIATIONS FROM THE SAP

Deviations from the SAP included adjustment of sampling depths, the inability to collect certain proposed samples as a result of drilling refusal, and the addition of one sampling location.

4.4.1 Sampling in Vicinity of IWTP 360

Soil and groundwater sampling depths originally proposed in the SAP were developed based on existing knowledge of site conditions. Depth to groundwater at Alameda Point can be highly variable based on seasonal recharge conditions, local topography, site conditions, and tidal influences. Soil sampling depths were proposed for 1.5 to 2.0 feet and 7.5 to 8.0 feet or at the groundwater interface, whichever is shallower. Groundwater samples were proposed for two depths within the first water-bearing zone. During this investigation, groundwater was encountered at approximately 5 feet bgs; the depth of the deeper soil sample (groundwater interface) and the deeper groundwater sample were adjusted accordingly.

At location IWTP360-DP04, no deep groundwater sample was collected as a result of slow recharge conditions, likely a reflection of lithologic conditions within and near the top of the Bay Sediment Unit.

4.4.2 Sampling along the Pipelines

Soil and groundwater sampling locations proposed along the pipelines were selected based on prior knowledge of site conditions. Two vacuum excavation locations were proposed south of IWTP 360, where previous investigations had encountered a large pier-like structure during soil excavation under IWTP 360 (Section 2.3). This structure was encountered in vacuum excavation locations IWTP360-VE01 and -VE02, inside the fenced area between Buildings 414 and 163. Both excavations reached a maximum depth of 4.5 feet, where concrete was encountered. Two soil samples were collected from IWTP360-VE01, and one was collected from IWTP360-VE02. Groundwater was not encountered in either excavation.

At location IWTP360-VE05, no groundwater sample was collected as a result of slow recharge conditions, likely a reflection of lithologic conditions within and near the top of the Bay Sediment Unit.

As noted in Section 4.2.2, one direct-push sampling location (IWTP360-DP05) was added near the northwestern end of the pipelines to provide additional data along the pipelines. One shallow soil sample was collected from 1.5 to 2 feet bgs, and another was collected from below the pipes from 4.5 to 5 feet bgs. A HydroPunch®groundwater sample was collected from 8 to 10 feet bgs.

4.4.3 Deviation Summary

Sixteen soil samples were proposed in the SAP, and seventeen were collected. Twelve groundwater samples were proposed in the SAP; nine were collected. Four proposed samples were not collected due to refusal at two sampling locations and insufficient recharge at two other locations. One direct push sampling location was added south of IWTP 360, along the pipelines. As requested by DTSC in comments on the final SAP (DTSC, 2004), soil and groundwater were analyzed for the full suite of CLP metals and hexavalent chromium rather than the metals initially proposed in the SAP (cadmium, chromium (total and hexavalent), copper, lead, nickel, and silver).

4.5 DATA QUALITY ASSESSMENT

Data quality is assessed through data verification and validation processes and an evaluation of the degree to which project-specific DQOs were achieved. Acceptability of data, evaluated by the parameters of precision, accuracy, representativeness, completeness, and comparability (collectively known as PARCC parameters), is determined through the process of data validation. During data validation, analytical quality control results are compared to established criteria for acceptability. Analytical sensitivity, as determined by reporting limits, is also assessed as part of the DQO evaluation.

DQOs for sampling at IWTP 360 at Alameda Point were developed in accordance with EPA guidance for the DQO process (EPA, 2000a). DQOs are described in detail in the SAP (Tetra Tech, 2004b). In general, the DQOs for sampling at IWTP 360 were designed to determine whether metals, including hexavalent chromium, were present in subsurface soils at concentrations exceeding PRGs (EPA, 2002) or in shallow groundwater at concentrations exceeding MCLs. The SAP recommended that a human health risk assessment be conducted if soil or groundwater concentrations exceeded screening levels. Sampling locations were placed using prior knowledge of site conditions and professional judgment in the area near the former treatment plant and pipelines.

Over a period of 3 days, 13 groundwater samples, including two duplicate pairs, and 17 soil samples were collected and submitted for laboratory analysis. The 13 groundwater samples submitted for analysis also included the following four field quality control (QC) samples: two field duplicate samples, one equipment rinsate sample, and one source water blank. No field duplicate samples were collected for soil because of the heterogeneous nature of the soil matrix. Samples were analyzed by APCL at its laboratory in Chino, California, and by C&T at its laboratory in Berkeley, California. Definitive data (as defined in the SAP) for Alameda Point were generated for metals, including hexavalent chromium.

Soil and groundwater samples were analyzed and tracked in batches called sample delivery groups (SDG), consisting up to 19 samples each. SDGs are generally limited to 20 samples or less. Analytical results were submitted to Tetra Tech by SDG. The laboratories followed the analytical methods specified in the SAP. Laboratory Data Consultants, Inc. (LDC) in Carlsbad, California performed analytical data validation in accordance with procedures outlined in the EPA CLP functional guidelines for inorganic data review (EPA, 1994b) and the data validation statement of work for Navy CLEAN II (Tetra Tech, 2001). APCL and C&T provided LDC with the following information, as required to validate the data: raw data, instrument calibration information, instrument printouts for samples and standards, instrument run logs, bench sheets, standards preparation information, and QC sample results.

A cursory validation was performed by LDC on the data for 26 samples, and a full validation was performed on the data for 4 samples, according to the validation procedures outlined in the SAP. The SAP specified that 20 percent of the samples were to be selected for full validation. The frequency of full validation for this sampling event was 15 percent, which does not meet the goal of 20 percent; however, this is not anticipated to have a significant effect on data quality because no major data quality problems were identified. Validated analytical results, which meet regulatory and method specifications, provide definitive data, as defined by the DQO process for Superfund (EPA, 1994a). Definitive data are suitable for site characterization and risk assessment and, therefore, support project DQOs.

4.5.1 Critical Parameters

Data were evaluated for acceptable quality and quantity. This evaluation was based on the PARCC critical indicator parameters. Each of the PARCC parameters are discussed in the following sections.

4.5.1.1 Precision

Precision is a measure of the variability associated with the entire sampling and analysis process. It is the comparison among independent measurements as the result of repeated application of the same process under similar conditions. It is determined by the analysis of field duplicate pairs, matrix spike duplicate (MSD) pairs, and matrix duplicate (MD) pairs. Precision is expressed as the relative percent difference (RPD) of a pair of values (or results). Acceptance criteria for each analytical methodology are stated in Appendix A of the SAP (Tetra Tech, 2004b). As part of the data validation process, field duplicate, MSD, and MD results were evaluated for compliance with acceptance criteria for precision for each analytical method. RPD evaluations are documented in individual data validation reports for each SDG (Appendix E).

Field duplicate pairs were evaluated for each analysis performed on groundwater samples. Field duplicates were not collected for soil samples because of the heterogeneous nature of the soil matrix. Two groundwater field duplicate pairs (15 percent of the environmental water samples submitted for analysis) were submitted during this sampling event. The field duplicate frequency met the goal identified in the SAP of 10 percent of field groundwater samples. Field duplicate results met the guidance criteria of 25 percent RPD, with the exception of aluminum and iron. Results with RPDs outside of the guideline of 25 percent were not qualified. EPA CLP guidelines for inorganic data review provide general guidance in evaluating field duplicate samples, but they do not provide acceptance criteria. Sample results are generally not qualified on the basis of field duplicate results.

Matrix spikes (MS) were analyzed for each analysis and matrix (water or soil). Frequency criteria for MSD or MD pairs specified in the SAP (Tetra Tech, 2004b) are 5 percent of the samples or one pair per analytical batch. MSD frequency for each method was 13 percent, which meets the established criteria. No precision problems were observed for MSD or MD results.

4.5.1.2 Accuracy

Accuracy is the degree to which a measurement agrees with its true value and is expressed as percent recovery. Acceptance criteria for each analytical methodology are stated in Appendix A of the SAP. Accuracy is assessed by comparing the recoveries of MS samples and laboratory control samples (LCS), to associated control limits. Through the process of data validation, MS and LCS recoveries were evaluated for compliance with acceptance criteria for accuracy for each analytical methodology. The frequency of analysis of MS samples met the criteria specified in the SAP of 5 percent of the samples, with an overall frequency of 13 percent. No accuracy problems were observed for the metals and hexavalent chromium analyses. LCSs were analyzed for each SDG. LCS percent recoveries were within QC limits for all analyses.

4.5.1.3 Representativeness

Representativeness is a qualitative parameter which is defined by the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or a process or environmental condition. Sample results were evaluated for representativeness by examining items related to sample collection, including chain-of-custody documentation, sample labeling, collection dates, and the condition of the samples upon receipt at the laboratory. Laboratory procedures were also examined, including anomalies reported by the laboratory, either upon receipt of the samples at the laboratory or during analytical processes; adherence to recommended holding times for samples prior to analysis; calibration of laboratory instruments; adherence to analytical methods; quantitation limits used for samples; and completeness of data package documentation. Any item that may have adversely affected the representativeness of the sample result was documented in the data validation narratives (Appendix E).

All samples were analyzed within the holding times specified by the methods. All water and soil samples were received at the laboratories at the appropriate temperatures of 2 to 6 degrees centigrade. Initial and continuing calibration checks for analytical instruments met QC criteria for all analyses, with the following exception: because of a continuing calibration problem with the analytical instrument, 29 results for copper were qualified as estimated. One calibration check sample for copper exceeded the upper control limit. Associated detected sample results were qualified as estimated (the validation qualifier "Jf" was assigned), and nondetected results were qualified as estimated nondetected ("UJf") because of the potential for a high bias based on a high calibration check. Details can be found in the data validation narratives in Appendix E. Project-required quantitation limits listed in the SAP were met for all analyses with the exception of arsenic in soil. The laboratory reported nondetected results for arsenic in soil were above the project-required reporting limits (PRRL) of 0.3 mg/kg. The impact of this anomaly will be addressed as part of the risk assessment for arsenic. Overall, the quantitation limits achieved for the sampling event were adequate to meet the DQOs.

Source water blank, equipment rinsate, laboratory method blank, and instrument calibration blank results were evaluated during the data validation process to determine whether source water (source water blank), equipment decontamination procedures (equipment rinsate), or laboratory conditions (method and calibration blanks) may have affected sample results. Blank contamination indicates the potential for false positive results at low concentrations and the potential for a high bias in detected results. Because of blank contamination in all 30 samples, a data validation qualifier of "UJb" was added to the metals results to indicate that the result should be considered an "estimated value". In all, 178 results were qualified as estimated nondetected (or "UJb"). These results may be false positives, and the "UJb" qualifier eliminates this problem. A discussion of analytical results for the source water blank, equipment rinsate, and laboratory method and calibration blanks is included for each analysis in the validation narratives included in Appendix E. A comparison of source water blank results and equipment rinsate results did not indicate any contributions from the equipment decontamination process.

4.5.1.4 Completeness

Completeness is defined as the percentage of measurements judged to be valid (not rejected or related to sampling errors). The completeness of sample results is determined through the data validation process. All rejected ("R"-qualified) sample results and missing analyses are considered incomplete. Data that are qualified as estimated ("J"-qualified) or estimated nondetected ("UJ"-qualified) are considered to be valid and usable. Completeness is calculated and reported for each method and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set.

A completeness goal of 90 percent was specified in the SAP. For this sampling event, no analytical results were rejected, resulting in 100 percent analytical completeness. Some of the planned samples identified in the SAP were not collected because of problems encountered in the field, and samples were collected at one additional sample point that was not described in the SAP. These changes are addressed previously in Section 4.4.

4.5.1.5 Comparability

Comparability of the data is a qualitative parameter that expresses the confidence with which one data set may be compared to another. Comparability of the data is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions, and using standardized reporting formats and data validation procedures. Elevated reporting limits were assessed during the data validation process to determine whether a justifiable reason existed for the raised limits. Reporting limits for metals were frequently raised because of blank contamination; however, this had a limited impact on the usability of the data.

4.5.2 Data Validation Summary

APCL and C&T submitted analytical reports with laboratory qualifiers, which are defined by laboratory standard operating procedures. Laboratory-defined qualifiers identify such items as nondetected values; values below the PRRL, which are considered to be estimated values; and values with analytical anomalies such as QC deficiencies. These laboratory data qualifiers were replaced with functional guideline (EPA, 1994b) data validation qualifiers during data validation. During data validation, LDC completed worksheets documenting the criteria reviewed. These worksheets were used to generate validation narratives and are not included in this report. The worksheets are archived with project files. A validation narrative was prepared for each SDG. Each validation narrative contains a list of the samples in that SDG, analyses performed, the identity of the samples receiving full validation, and results of the validation for each method.

After the data were reviewed, data validation qualifiers were applied to analytical results. Data validation qualifiers are alphabetic characters placed adjacent to each reported value that correspond to definitions specified in the validation report. In addition to associated qualifiers, the printed tables for the validated laboratory analytical data also include a comment column containing any comment codes. The letters a through h were used to reference different QC issues that may have affected analytical results. Associated definitions for these comment codes are provided in the validation reports. Laboratory data were received electronically from the laboratories and added to a database. A database program allowed (1) EPA data validation qualifiers to replace original laboratory qualifiers and (2) the generation of tables that could be printed with validated results in various formats.

All groundwater samples were filtered and preserved in the field; therefore, analysis generated results for dissolved metals. Inductively coupled plasma serial dilutions and spectral interference check analyses were performed at required frequencies. Analytes detected at concentrations greater than the instrument detection limit but less than the PRRL were qualified as estimated (a "Jg" qualifier was assigned).

4.5.3 Summary Assessment of Sample Data

Analytical results of the 2004 sampling event met project objectives for the quantity and quality of data required to support decisions to be based on this investigation. No data were rejected from this sampling event. Data without qualifiers and data qualified as estimated with a "UJ" or "J" qualifier are usable for purposes in supporting project objectives. Validated data for the IWTP 360 investigation at Alameda Point were found to be representative and comparable for all samples. Tetra Tech exceeded its completeness goal of 90 percent; actual completeness was 100 percent for this sampling event.

5.0 SUMMARY OF RECENT INVESTIGATION RESULTS

The following sections present the analytical results from the six soil and six groundwater samples collected in the vicinity of IWTP 360 and the eleven soil and three groundwater samples collected along the subsurface pipelines in March 2004.

5.1 RESULTS FROM SOIL AND GROUNDWATER SAMPLING AT IWTP 360

The range of detected concentrations of metals in soil samples collected in the vicinity of IWTP 360 is presented in the following table:

Contaminant	Range (mg/kg)	Detection Frequency	Industrial PRG (mg/kg)	Residential PRG (mg/kg)
Aluminum	4,070 to 5,340	6/6	100,000	76,000
Antimony	ND	0/6	410	31
Arsenic	**ND to 15.5**	**1/6**	**1.6**	**0.39**
Barium	38.4 to 92.4	6/6	67,000	5,400
Beryllium	ND	0/6	1,900	150
Cadmium[a]	ND	0/6	450	37
Calcium	3,000 to 11,000	6/6	NA	NA
Chromium (total)[a]	32.8 to 42.7	6/6	450	210
Chromium (hexavalent)[a]	ND	0/6	64	30
Cobalt	5.1 to 10.2	6/6	1,900	900
Copper[a]	ND to 56.6	2/6	41,000	3,100
Iron	**8,340 to 28,800**	**6/6**	**100,000**	**23,000**
Lead[a]	**2.6 to 215**	**6/6**	**NA**	**150**
Magnesium	2,380 to 3,190	6/6	NA	NA
Manganese	103 to 288	6/6	19,000	1,800
Mercury	ND to 0.11	3/6	310	23
Molybdenum	ND	0/6	5,100	390
Nickel[a]	24.8 to 47.3	6/6	20,000	1,600
Potassium	368 to 452	6/6	NA	NA
Selenium	ND	0/6	5,100	390
Silver[a]	ND	0/6	5,100	390
Sodium	ND	0/6	NA	NA
Thallium	ND	0/6	67	5.2
Vanadium	19.4 to 32.1	6/6	7,200	550
Zinc	16.3 to 101	6/6	100,000	23,000

Notes:
a Metals identified as potentially impacting site based on prior use
NA Not applicable
ND Not detected

Arsenic, iron, and **lead** were detected at concentrations exceeding the residential PRGs in a soil sample from boring location IWTP360-DP01. No other metals were detected in concentrations above the residential PRG in samples collected in the vicinity of IWTP 360.

The range of metals detected in groundwater samples collected in the vicinity of IWTP360 is summarized as follows:

Contaminant	Range (µg/L)	Detection Frequency	Tap Water PRG (µg/L)	MCL (µg/L)
Aluminum	**ND to 3,150**	**2/6**	**36,000**	**1,000**
Antimony	ND	0/6	15	NA
Arsenic	**ND to 41.1**	**3/6**	**0.045[b]**	**50**
Barium	58.7 to 194	6/6	2,600	1,000
Beryllium	ND	0/6	73	4
Cadmium[a]	ND	0/6	18	5
Calcium	56,800 to 93,300	6/6	NA	NA
Chromium (total)[a]	**2.3 to 274**	**6/6**	**NA**	**50**
Chromium (hexavalent)[a]	ND to 20.0	1/6	110	NA
Cobalt	ND	0/6	730	NA
Copper[a]	ND	0/6	1,500	1,300
Iron	**ND to 3,980**	**5/6**	**11,000**	**300[c]**
Lead[a]	ND	0/6	NA	15
Magnesium	12,400 to 29,100	6/6	NA	NA
Manganese	**82.6 to 2,070**	**6/6**	**880**	**50[c]**
Mercury	ND	0/6	11	2
Molybdenum	ND to 49.5	4/6	180	NA
Nickel[a]	ND to 78.3	4/6	NA	100
Potassium	1,890 to 11,600	6/6	NA	NA
Selenium	ND	0/6	180	50
Silver[a]	ND	0/6	180	100[c]
Sodium	30,300 to 94,200	6/6	NA	NA
Thallium	ND	0/6	2	2
Vanadium	ND to 77.2	2/6	260	NA
Zinc	ND to 31	3/6	11,000	5,000[c]

Notes:
a Metals identified as potentially impacting site based on prior use
b Cancer endpoint PRG
c Secondary MCL
NA Not applicable
ND Not detected

Manganese was detected in one sample from boring IWTP360-DP02 in excess of the tap water PRG and **arsenic** was detected at concentrations in excess of the tap water PRG in three samples,

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but concentrations were less than the MCL. No other metals were detected at concentrations exceeding tap water PRGs in groundwater collected in the vicinity of IWTP 360.

Aluminum was detected at a concentration exceeding the MCL in one groundwater sample from boring IWTP360-DP03. Total **chromium** was detected at a concentration exceeding the MCL in one groundwater sample from boring -DP05. **Iron** was detected exceeding the secondary MCL in four samples: one each from borings -DP02, -DP03, -DP04 and -DP05. **Manganese** was detected at concentrations exceeding the secondary MCL in all six groundwater samples collected in the vicinity of IWTP-360.

5.2 RESULTS FROM SOIL AND GROUNDWATER SAMPLING ALONG THE PIPELINES

The ranges of metals detected in soil samples collected along the pipelines are as follows:

Contaminant	Range (mg/kg)	Detection Frequency	Industrial PRG (mg/kg)	Residential PRG (mg/kg)
Aluminum	3,390 to 5,620	11/11	100,000	76,000
Antimony	ND	0/11	410	31
Arsenic	**ND to 7.7**	**6/11**	**1.6**	**0.39**
Barium	35.5 to 279	11/11	67,000	5,400
Beryllium	ND	0/11	1,900	150
Cadmium[a]	ND to 18.9	4/11	450	37
Calcium	3,190 to 29,900	11/11	NA	NA
Chromium (total)[a]	26.8 to 205	11/11	450	210
Chromium (hexavalent)[a]	ND to 0.93	7/11	64	30
Cobalt	4.4 to 6.5	11/11	1,900	900
Copper[a]	ND to 94.7	10/11	41,000	3,100
Iron	6,860 to 16,600	11/11	100,000	23,000
Lead[a]	**4.7 to 264**	**11/11**	**NA**	**150**
Magnesium	1,880 to 4,930	11/11	NA	NA
Manganese	89.7 to 192	11/11	19,000	1,800
Mercury	ND to 0.13	7/11	310	23
Molybdenum	ND to 5.1	2/11	5,100	390
Nickel	24.1 to 184	11/11	20,000	1,600
Potassium	276 to 608	11/11	NA	NA
Selenium	ND	0/11	5,100	390
Silver[a]	ND to 4.2	3/11	5,100	390
Sodium	ND	0/11	NA	NA
Thallium	ND	0/11	67	5.2
Vanadium	14.9 to 25.2	11/11	7,200	550
Zinc	17.1 to 97.3	11/11	100,000	23,000

Notes:
a Metals identified as potentially impacting site based on prior use
NA Not applicable
ND Not detected

Lead was detected at a concentration exceeding the residential PRG in a sample collected from location IWTP360-VE05. Concentrations of **arsenic** exceeded the residential PRG in six samples from –VE02, -VE03, VE-04, VE-05, and VE-06 (2 samples). No other metals were detected at concentrations above residential PRGs in soil samples collected along the pipelines. The range of detected metals in groundwater samples collected along the pipelines is as follows:

Contaminant	Range (µg/L)	Detection Frequency	Tap Water PRG (µg/L)	MCL (µg/L)
Aluminum	147 to 313	3/3	36,000	1,000
Antimony	ND	0/3	15	NA
Arsenic	**ND to 19.9**	**1/3**	**0.045**[b]	**50**
Barium	ND to 112	1/3	2,600	1,000
Beryllium	ND	0/3	73	4
Cadmium[a]	ND	0/3	18	5
Calcium	11,600 to 83,900	3/3	NA	NA
Chromium (total)[a]	**4.5 to 47.6**	**3/3**	**NA**	**50**
Chromium (hexavalent)[a]	ND to 20	1/3	110	NA
Cobalt	ND	0/3	730	NA
Copper[a]	ND	0/3	1,500	1,300
Iron	**ND to 1,200**	**2/3**	**11,000**	**300**[c]
Lead[a]	ND	0/3	NA	15
Magnesium	2,480 to 31,900	3/3	NA	NA
Manganese	**ND to 1,860**	**2/3**	**880**	**50**[c]
Mercury	ND	0/3	11	2
Molybdenum	**21.8 to 272**	**3/3**	**180**	**NA**
Nickel	ND to 26.5	1/3	NA	100
Potassium	881 to 19,200	3/3	NA	NA
Selenium	ND	0/3	180	50
Silver[a]	ND	0/3	180	100[c]
Sodium	25,900 to 280,000	3/3	NA	NA
Thallium	ND	0/3	2	2
Vanadium	ND to 18	1/3	260	NA
Zinc	ND to 28.2	1/3	11,000	5,000[c]

Notes:
a Metals identified as potentially impacting site based on prior use
b Cancer endpoint PRG
c Secondary MCL
NA Not applicable
ND Not detected

Manganese was detected at concentrations exceeding the tap water PRG in both groundwater samples collected at location IWTP360-VE05. **Molybdenum** was detected exceeding the tap water PRG in a sample collected from -VE04. **Arsenic** was detected exceeding the tap water

PRG in a sample collected from -VE06. No other metals were detected at concentrations in excess of tap water PRGs in groundwater samples collected along the pipelines.

Total **chromium** was detected at a concentration exceeding the MCL in one groundwater sample collected from boring IWTP360-DP05. **Iron** concentrations exceeded the secondary MCL in three samples. Two of the samples were collected at location IWTP360-VE06, and one sample was collected from boring -DP05. **Manganese** was detected at concentrations exceeding the secondary MCL in four of five groundwater samples collected along the pipelines.

6.0 SITE CHARACETIZATION AND DATA SCREENING

The following sections discuss the IWTP 360 site characterization summary and the data screening rationale used to develop the HHRA data set (Appendix C).

6.1 SITE CHARACTERIZATION

In the vicinity of the former IWTP, soil samples were collected at depths from the ground surface to 12 feet bgs including extensive sampling south of IWTP 360 to define the lateral and vertical extent of metals contamination. Soil contaminated with metals was excavated to depths ranging from 10 to 12 feet bgs in December 2000. The most recent sampling activities were conducted to satisfy DTSC comments (DTSC, 2002) on the 2001 closure certification report and ongoing discussions between DTSC and the Navy regarding data gaps at the site.

Cadmium and chromium were established as the metals of concern for the vicinity of the excavation. Soil samples collected east of the excavated area in 2004 were non-detect for cadmium and hexavalent chromium and less than 20 percent of the residential PRG for total chromium.

In the vicinity of the former IWTP 360, groundwater samples were collected at four locations around the perimeter of the excavated area to investigate whether groundwater had been affected by contaminated soil remaining in the area at depths of 12 to 14 feet bgs. These data were incorporated into the HHRA (Appendix C).

Soil and groundwater was also sampled along the pipelines as requested by DTSC. Soil samples were collected at 25-foot intervals from nine sampling locations at two depths along the length of the pipelines. In addition, groundwater samples were collected at six sampling locations along the length of the pipelines. These data were also incorporated into the HHRA.

The series of investigations conducted at IWTP 360 have adequately characterized the soil and groundwater conditions in the vicinity of the former IWTP and along the underground pipelines from Building 360 to IWTP 360. The 2004 sampling was conducted in response to DTSC comments regarding data gaps for the site (DTSC, 2002).

Metals data from the investigations conducted between 2000 and 2004 were used in conducting the HHRA.

6.2 DATA SCREENING

Soil and groundwater analytical results for all investigations conducted at the site are tabulated in Appendix A. These tables list validated analytical data (Table A-1), unvalidated analytical data (Table A-2) (the samples collected in 1997 by E&E), and analytical data for ex situ soil (Table A-3) (the soil removed by IT in 2000). Metals previously treated at the IWTP and listed as managed hazardous wastes are provided in E&E, 1995.

6.2.1 VALIDATED VS. UNVALIDATED DATA

Results from the initial characterization data collected by E&E in 1997 (see Table A-2) were used to guide subsequent investigations, but were not validated and were not used in the HHRA (Appendix C).

6.2.2 REMOVED DATA

A soil excavation was conducted at the site from December 2000 to January 2001 to remove soil contaminated with cadmium and chromium as a result of IWTP 360 operations (IT, 2001b). The analytical results from these removed samples (see Appendix A, Table A-3) are not representative of site conditions and will not be included in further evaluations of the site.

7.0 BACKGROUND COMPARISON

Metals data for soil and groundwater at Alameda Point considered naturally occurring and not related to historical site activities were compared with analytical results for samples representative of current conditions at IWTP 360. This comparative evaluation was used to identify: 1) those metals whose presence in soil or groundwater at IWTP 360 potentially resulted from historical site activities and 2) those metals in the soil or groundwater that are naturally occurring (background).

The background metals values for soil and groundwater were obtained from the previously published *Summary of Background Concentrations in Soil and Groundwater, Alameda Point* by TtEMI, dated December 2001 (provided as Attachment 1). The methodology used to compare the background data set to samples representative of current conditions at the sites is presented in Appendix B and summarized below.

7.1 BACKGROUND SOIL AND GROUNDWATER EVALUATION

Areas of Alameda Point with geologically similar soils were grouped into background data sets designated "pink", "blue", and "yellow". The background evaluation for soil consisted of comparing the soil background data set from the blue area with analytical results representative of IWTP 360 to determine which metals in soil are attributed to background. As discussed in the 2001 background study, 35 wells were identified as being unaffected by site related groundwater contamination. Filtered metals data were used to constitute the ambient metals data set. The background groundwater evaluation consisted of comparing the background groundwater data set for Alameda Point with groundwater analytical results representative of IWTP 360 to determine which metals in groundwater are attributable to background. To facilitate the evaluation, raw laboratory results were obtained from TtEMI for the soil and groundwater samples used in the 2001 background study.

Two-population statistical tests were used to compare concentrations of background metals for Alameda Point soil and groundwater to metal concentrations detected at IWTP 360 to determine which metals are present at concentrations above naturally occurring levels (greater than background). Initial statistical tests consisted of both graphical and numerical Quantile Tests. Based on the results of both the graphical and numerical Quantile Tests, a subset of metals were further anayzed using either the Wilcoxon Rank Sum Test or Gehan Nonparametric Test, depending on the percentage of non-detects and other factors.

7.2 RESULTS OF BACKGROUND SOIL AND GROUNDWATER COMPARISON

Based on a comparison of the IWTP 360 soil data with the background data set for the blue area, the following metals in soil at IWTP 360 are considered chemicals of potential concern (COPC):

- Barium
- Calcium
- Chromium
- Chromium VI
- Cobalt
- Lead
- Molybdenum
- Nickel
- Silver

Based on the background comparison, the following metals in groundwater at IWTP 360 are attributed to background:

- Arsenic
- Calcium
- Chromium
- Chromium VI
- Nickel
- Vanadium
- Zinc

8.0 HUMAN HEALTH RISK ASSESSMENT

In accordance with the decision criteria stated in the DQOs (see Table 1) developed for the closure confirmation investigation conducted in 2004, a HHRA has been prepared for IWTP 360. The DQO criteria state that a HHRA should be conducted if any analytical results exceed the PRGs (EPA, 2002). As shown in Section 5.0 of this report, PRGs were exceeded for a few metals; a HHRA was prepared (and is provided in Appendix C) to evaluate whether metals detected in soil or groundwater could pose significant risk to human health. The results of the HHRA risk calculations were used to support the risk management evaluation presented in Section 9.0 of this report; the risk management evaluation is used to determine whether further action is needed at IWTP 360.

The methods and assumptions used to evaluate human health risks were consistent with DTSC guidelines for human health risk assessments and drawing from Risk Assessment Guidance for Superfund (RAGS). In addition, the DTSC lead risk model called LeadSpread 7 (DTSC, 2003) was used to assess lead health risks for children. An important note is that an HHRA is intentionally based upon a series of assumptions expected to yield a very conservative estimation of risks and does not necessarily represent actual risks to a specific receptor.

The HHRA is composed of the four components listed below:

- Data Evaluation and Selection of Chemicals of Potential Concern (COPC), consisting of an evaluation of the data and selection of COPCs in site media.
- Exposure Assessment, involving an evaluation of potential exposure pathways from the COPCs to human populations.
- Toxicity Assessment, consisting of compiling toxicity values that characterize potential adverse health effects of exposure to COPCs.
- Risk Characterization, consisting of the quantitative characterization of potential human health risks associated with exposure to COPCs.

The HHRA, updated to reflect comments from DTSC to the *Draft Amendment to Closure Summary Report* is summarized below. The updated HHRA is presented as Appendix C of this report.

8.1 DATA EVALUATION AND IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

The first step of the HHRA process consisted of reviewing and evaluating available data and identifying COPCs in the environmental media (such as groundwater and soil).

8.1.1 Data Evaluation

The area of potential soil and groundwater exposure was defined as the area within the boundaries of IWTP 360 and also the area outside IWTP 360 in the vicinity of the pipelines running from Building 360 to IWTP 360. Soil and groundwater data were collected within this area during various sampling efforts, and these data were used to characterize the area. Data were considered to be appropriate for use in the HHRA, however, if they (1) were validated, (2) were not qualified rejected (R), (3) met the DQO for the closure plan amendment (Tetra Tech, 2004a), and (4) reflect current site conditions. For example, data for soil no longer present in the area because of excavations were not included in the HHRA because they do not reflect current site conditions. Because there are no permanent monitoring wells installed within IWTP 360, filtered direct-push groundwater data were used in the HHRA.

Based on comments from DTSC, the updated HHRA evaluated the risk associated with soils at the site from two depth intervals; surface soils representing a depth interval of 0-1 foot, and subsurface soils representing a depth interval of 0-10 feet. Soil and groundwater samples were assessed for metals only. Cyanide and other analytical groups were not assessed in the HHRA because they were not considered to be chemicals of interest (see Section 3).

8.1.2 Identification of Chemicals of Potential Concern

The background evaluation discussed in Section 7 identified the metals at the site considered to be COPCs. The COPCs were used to calculate risks associated with the site in the updated HHRA. To evaluate the contribution of background metals to a receptor's risk, background risks were also calculated using the 95% upper confidence interval (UCL) values for blue background soil and background groundwater provided in the 2001 background study.

8.2 EXPOSURE ASSESSMENT

An exposure assessment includes an evaluation of potential human receptors that could come in contact with site-related chemicals as well as exposure routes, magnitude, frequency, and duration. Quantitative assessment of human exposure to contaminants in the environment involves the following steps:

- Characterization of the exposure setting(s) and identification of potential future human receptors
- Identification of exposure pathways and exposure routes
- Estimation of exposure point concentrations (EPC)
- Quantification of chemical intake for pathway specific exposures for each potential receptor

8.2.1 Characterization of the Exposure Setting, Pathways, and Routes

Estimating human exposure to contaminants requires that specific assumptions be made regarding how and at what frequency an individual will contact the subject chemicals. These exposure patterns are collectively referred to as an "exposure scenario". Exposure scenarios depend the current and future use scenarios for the property (residential, commercial/industrial, or construction). All three uses might be applicable at a single site.

According to the Naval Air Station Alameda Community Reuse Plan (EDAW, 1996) and the updated Preliminary Development Concept (Roma Design Group, 2006), IWTP 360 and surrounding area is designated as commercial/industrial use, therefore future exposure to soils and groundwater would be consistent with hypothetical future commercial/industrial worker population. Additionally, future construction at the site to support the identified future land use as commercial/industrial would result in exposure by hypothetical future construction worker population. To evaluate closure with unrestricted future land use, a hypothetical future residential population was also considered.

The exposure scenarios were evaluated for the following pathways:

- Residential - soil ingestion, dermal contact with soil, inhalation of particulates from soil, and ingestion and dermal contact with groundwater
- Commercial/Industrial - soil ingestion, dermal contact with soil, and inhalation of particulates from soil
- Construction Worker - soil ingestion, dermal contact with soil, and inhalation of particulates from soil; and ingestion and dermal contact with groundwater

Because these pathways are based on future exposures, they are considered potentially complete and are evaluated to provide a conservative estimate of risk.

8.2.2 Estimation of Exposure Point Concentrations

EPC is an estimate of the true arithmetic mean concentration of a chemical in a medium to which a human receptor may be exposed. Due to uncertainty in estimating the true arithmetic mean given the typically small sample populations in environmental work, EPA recommends using the 95% upper confidence limit (UCL) of the arithmetic mean in estimating the EPC. For this updated HHRA, EPCs were calculated using the following methodology:

- less than 15% non-detect values, substitute ½ the detection limit for ND values and calculate 95% UCL using ProUCL;
- between 15% and 85% ND values, estimate the 95% UCL using the bounding approach per EPA 2002; and
- greater than 85% ND values, use the maximum value.

EPCs were calculated for surface soils (0 to 1 foot bgs) and subsurface soils (0 to 10 feet bgs), and for groundwater, and were calculated for the COPCs as presented in the background evaluation in Appendix B.

8.2.3 Quantification of Chemical Intake

Chemical intake rates were estimated for all complete exposure pathways based on the EPCs and on the estimated magnitude of exposure to contaminated media. Exposure is based on "intake", which is defined as the mass of a substance taken into the body per unit body weight per unit time. Intake from a contaminated medium is determined by the amount of the chemical in the medium, the frequency and duration of exposure, body weight, the contact rate, and the averaging time. Both site-specific and default values for exposure parameters were used in the updated HHRA. Default hypothetical exposure parameters recommended by EPA Region 9 and DTSC were employed, as referenced in detail for each parameter and scenario in the updated HHRA.

8.3 TOXICITY ASSESSMENT

Standard toxicological methodologies for assessing the toxicity of chemicals involve quantifying the dose-response relationships for adverse human health effects associated with exposure to specific chemicals. There are two categories of toxic chemicals, carcinogenic and non-carcinogenic. While not all chemicals have carcinogenic potential, most were assumed to have some non-carcinogenic effect at a high dose. Carcinogenic chemicals' potency was evaluated and presented separately from non-carcinogenic chemical potency. EPA- and DTSC-derived toxicity values were gathered for the metals included in the updated HHRA.

8.4 RISK CHARACTERIZATION

The final step in the updated HHRA is the characterization of the potential risks associated with exposure to detected chemicals. Risk characterization combines the exposure and toxicity assessment to produce quantitative estimates of health effects from COPCs. Chemicals might present cancer risks and non-cancer health effects; therefore, the potential for both types of effects was evaluated.

It is important to note that the non-cancer hazard index (HI) is estimated differently than lifetime cancer risk; specifically, a child's exposure is not added to the projected adult exposure. Non-cancer effects manifest over a specific time period, and once the exposure period is over, the hazard has also passed (that is, no latency is assumed). Because a child's exposure is much larger at a given concentration because of its lower body weight, risk management decisions for chemicals with non-cancer health effects are based on the HI for a child (the receptor with the highest potential risk) for the residential scenario.

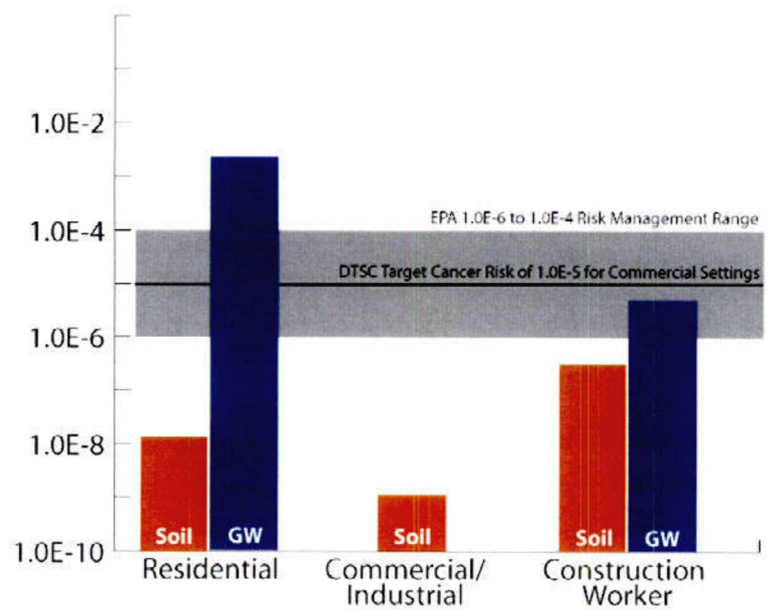
If the resulting range of incremental site HIs are less than 1, it is assumed that there is no significant potential for non-carcinogenic health effects due to cumulative effects. If the HI is greater than 1, a more refined analysis is required. This analysis is known as "segregation of hazard indices" (EPA, 1989). In this analysis, chemicals that have similar target organs are grouped together, and an HI is calculated for each group. If the HI for a target organ exceeds 1, there is potential for non-cancer health effects.

Unlike non-cancer health effects, which assume that there is no significant potential for non-carcinogenic health effects if the HI is below 1, carcinogenic risks associated with exposure to chemicals classified as carcinogens are estimated as the incremental probability that an individual will develop cancer over a lifetime as a direct result of an exposure. The estimated risk is expressed as a unitless probability. To aid in the interpretation of the results of the risk assessment, EPA guidance presents a range of goals for residual carcinogenic risk, which is "an excess upper-bound lifetime cancer risk to an individual of between 1 in 1,000,000 to 1 in 10,000" or between 10^{-6} and 10^{-4}. The range between 10^{-6} and 10^{-4} is referred to as the "risk management range" in the updated HHRA results. This risk management range was developed to protect human health and to help risk managers to assess whether site risks are great enough to warrant further action or if there is justification for taking no action. Site carcinogenic risk is calculated by adding risk to an adult and child from surface or subsurface soil and groundwater. The site non-cancer site HI is calculated by adding the HI for a child from soil and groundwater.

The site risk, which includes risk from soil and groundwater from COPCs, is summarized in Section 8.4.1 for all scenarios. Background risk (which includes both COPC and non-COPC metals at background concentrations) is summarized in Section 8.4.2, and incremental risk (estimated by subtracting the background risk from the site risk) is summarized in Section 8.4.3. The health effects associated with exposure to lead are presented in Section 8.4.4.

8.4.1 Calculated Site Risk

Using the exposure pathways discussed above, site carcinogenic risks and non-cancer health hazards are shown below.



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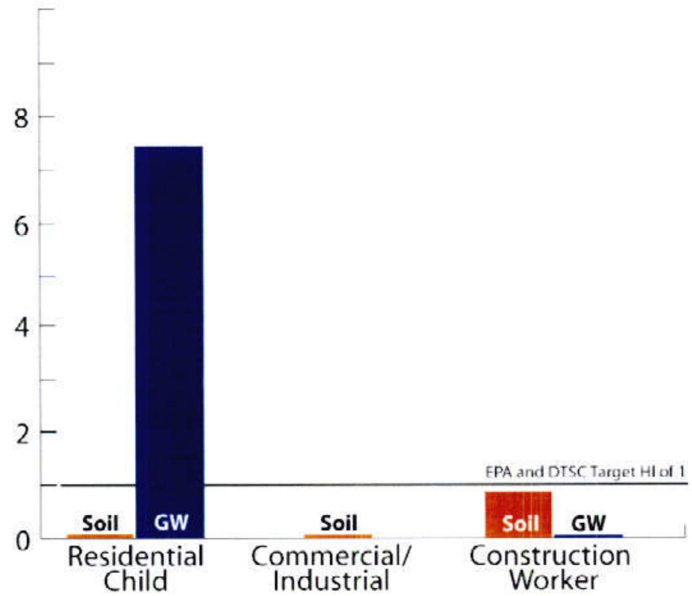
As shown graphically above, site carcinogenic risks from COPCs in soil for all three hypothetical future populations are well below both EPA's risk management range of 10^{-4} to 10^{-6} and DTSC's target cancer risk (10^{-6} for residential land-use settings and 10^{-5} for construction workers). However, site carcinogenic risk from groundwater is above both EPA's risk management range and DTSC's target risk for future hypothetical residents. The risk is directly attributable to ingestion of arsenic in groundwater. Site carcinogenic risks from groundwater COPCs for hypothetical future construction workers are below EPA's risk management range and DTSC's target risk for commercial settings.



As shown graphically above, non-carcinogenic hazard indices (HI's) from COPCs in soil for all three hypothetical future populations are well below EPA's and DTSC's target HI of 1. However, site HI from COPCs in groundwater for future hypothetical residents (in this case, the residential child, the most sensitive receptor) is above EPA's and DTSC's target HI. The HI is directly attributable to the potential adverse health effects from ingestion of arsenic and vanadium in groundwater. Site HI from COPCs in groundwater for the hypothetical future construction worker population is below EPA's and DTSC's target HI of 1.

Site, background and incremental carcinogenic risks and non-carcinogenic hazards are summarized by receptor in Table 7 and discussed below. The carcinogenic risks and non-carcinogenic hazards were calculated using DTSC-based assumptions. Planned reuse for the area is commercial/industrial. Residential reuse is not anticipated for the site.

Summary of Calculated Carcinogenic Risk

Exposure Scenario		Site Risk	Background Risk	Estimated Incremental Risk
Commercial/Industrial		3.71E-09	2.36E-05	-- (1)
Construction				
	Surface soils	2.79E-06	4.74E-06	-- (1
	Subsurface soils	4.51E-06	4.74E-06	-- (1)
Residential				
	Surface soils	3.35E-03	1.51E-03	1.84E-03(2) (from groundwater only)
	Subsurface soils	3.35E-03	1.51E-03	1.84E-03(2) (from groundwater only)

(1) Background risk is higher than site risk, thus no estimated incremental risk is attributed to the site.
(2) Estimated incremental risk is from the potential exposure to arsenic in groundwater only. Removing arsenic, considered background, results in no estimated incremental risk attributed to the site.

No incremental risk is attributed to the site based on both hypothetical future commercial/ industrial worker and hypothetical future construction workers. Incremental risk to potential future residential use, the most conservative scenario, is above the risk management range. However, this incremental risk is entirely from potential exposure to arsenic in groundwater. There is no incremental risk attributed to hypothetical future residential population from soils at the site.

Summary of Calculated Non-Carcinogenic Hazards

Exposure Scenario		Site HI	Background HI	Estimated Incremental HI
Commercial/Industrial		0.003	0.07	-- (1)
Construction				
	Surface soils	0.99	2.82	-- (1)
	Subsurface soils	0.62	2.82	-- (1)
Residential (Child)				
	Surface soils	7.52	7.79	-- (1)
	Subsurface soils	7.55	7.79	-- (1)

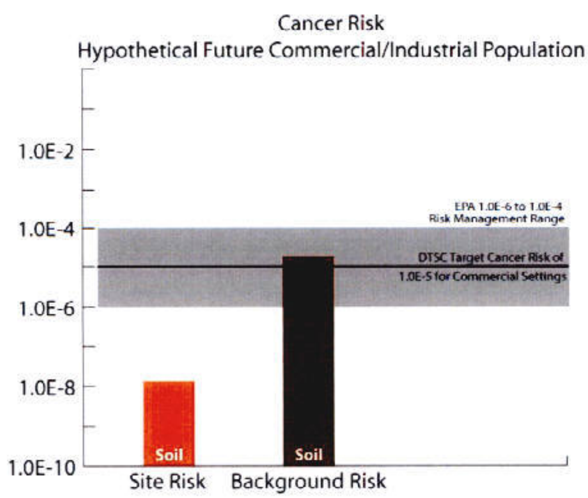
(1) Background HI is higher than site HI, thus no incremental non-carcinogenic hazard is attributed to the site.

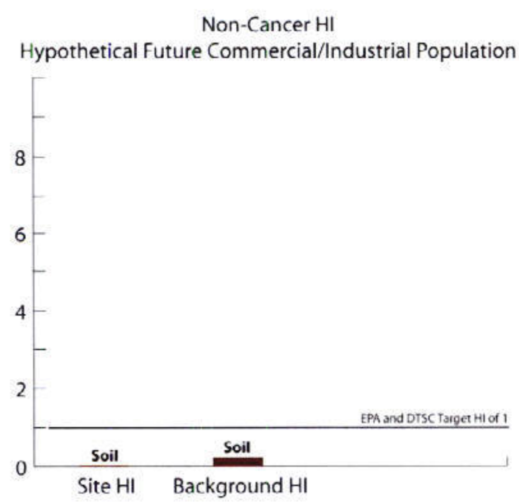
No incremental non-carcinogenic hazard is attributed to the site based on any of the exposure scenarios; hypothetical future commercial/industrial worker, hypothetical future construction worker, or hypothetical future residential population.

The carcinogenic risks and non-carcinogenic hazards for the exposure scenarios are further discussed in detail in the updated HHRA in Appendix C, and briefly discussed below by exposure scenario.

8.4.1.1 Commercial/Industrial Scenario

For the commercial/industrial scenario, the most likely scenario for reuse of the site, soil from the upper 1 foot was evaluated using the commercial/industrial scenario. No groundwater pathways were considered complete for the commercial/industrial scenario, as the site is served by municipal water supply and thus it is assumed groundwater would not be used for drinking water.

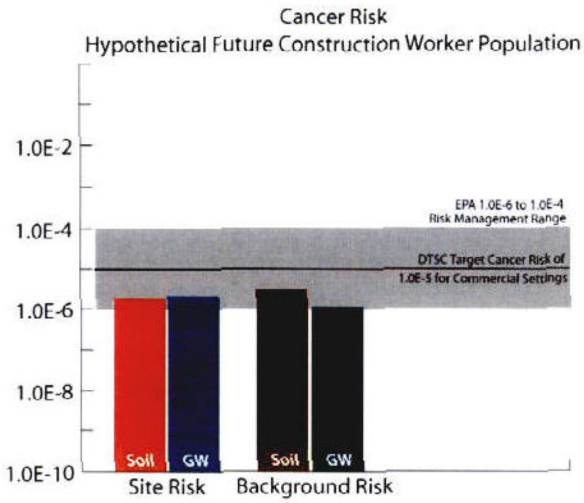


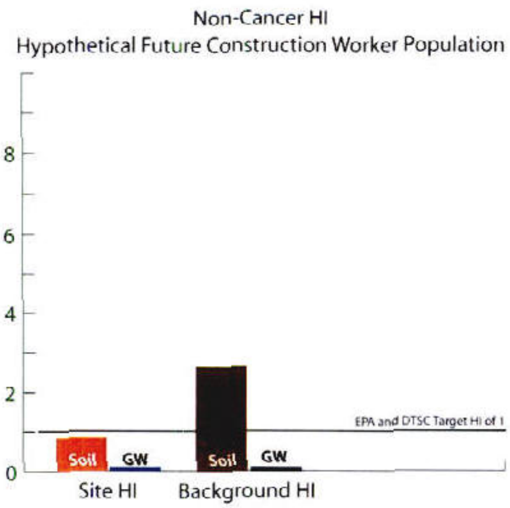


As shown above, the background risk is substantially higher than the risk contributed by COPCs at the site. Therefore, no estimated incremental carcinogenic risk or non-carcinogenic hazard is attributable to the site.

8.4.1.2 Construction Worker Scenario

Soil from the upper 1-foot and the upper 10 feet was evaluated using the construction worker scenario, along with incidental exposure to groundwater.

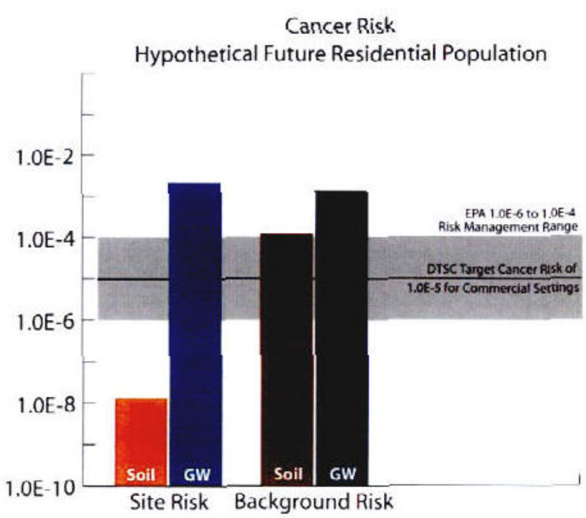


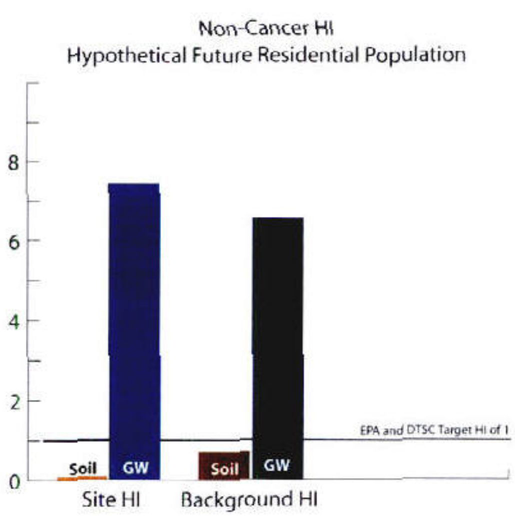


As shown above, the site and background risks are nearly equal, with the background risk from soil and groundwater combined slightly higher. Also, background is significantly higher than site for non-carcinogenic hazards. Therefore, no estimated incremental risk or non-carcinogenic hazard is attributable to the site.

8.4.1.3 Residential Scenario

According to the expected community reuse, commercial/industrial are identified as future land use for IWTP 360 and surrounding area. However, to evaluate unrestricted land use, risks to a hypothetical future residential population were evaluated.





As shown above, the background risk for soil is significantly higher than site risk, whereas site and background risks are nearly equal for groundwater, resulting in no estimated incremental risk from soil and groundwater combined attributable to the site. Also, site and background non-carcinogenic hazards are nearly equal, resulting in no estimated incremental non-carcinogenic hazard attributable to the site.

8.4.2 Health Effects Associated with Exposure to Lead

Lead was selected as a COPC for soil was evaluated using the LeadSpread model (DTSC, 2003). The EPC for lead in the surface soil was 5 mg/kg, and subsurface soil was 23.4 mg/kg. Lead was considered to be within background in groundwater (see Appendix B), with a background concentration in groundwater of 2.4 ug/L.

The model predicts that for a child ingesting site surface soil and background groundwater, the 95% estimate of blood lead is 1.6 micrograms per deciliter (µg/dL), compared to the comparison criterion of 10 µg/dL (see Appendix C). For a child ingesting site subsurface soil and background groundwater, the model predicts a blood lead of 2.1 µg/dL. Based on LeadSpread results, there is no potential risk to human health from ingestion of lead in IWTP 360 soil and groundwater.

8.5 UNCERTAINTY DISCUSSION

The exposure assessment relies on hypothetical future use of the land and the parameters that are available to estimate the magnitude and duration of exposures associated with those land uses. In this HHRA, reuse plans developed by the Alameda Reuse Authority were used to select future potential receptors, and future reuse is expected to be commercial/industrial. In addition, the site was evaluated for future construction workers developing the property for commercial/industrial use, and also hypothetical future residential scenario to evaluate future unrestricted use.

In general, a residential exposure assessment is considered the most conservative assessment because it involves the longest and most extensive contact with environmental media at a site. Inclusion of domestic use of groundwater in the residential exposure also increases the conservativeness of this assessment, especially because groundwater is not reasonably expected to serve as a public drinking water supply based upon the proposed land uses. In general, the residential exposure assessment overestimates future risk.

Varying degrees of uncertainty at each stage of the HHRA arise from assumptions made in the risk assessment and limitations of the data used to calculate risk estimates. Uncertainty and variability are inherent in the exposure assessment, toxicity assessment, and risk characterization. The HHRA was based upon a series of conservative assumptions expected to yield a very conservative estimation of risks.

9.0 RISK MANAGEMENT EVALUATION AND RECOMMENDATIONS

The following subsections present a risk management evaluation and recommendations for IWTP 360. The evaluation and recommendations are based on data collected during the previous investigations of IWTP 360, the data from the most recent closure confirmation investigation (presented in Section 5), the results of the HHRA (Section 8), and the results of an ERA for the CERCLA site (IR Site 4) that encompasses IWTP 360 (see Appendix D).

9.1 RISK MANAGEMENT EVALUATION

The planned reuse area where IWTP 360 is located is known as the Inner Harbor area. A portion of the Inner Harbor is identified in the community reuse plan for housing opportunities; however, the area around IWTP 360 and Building 360 is not included in the potential housing area, rather it is designated for commercial/industrial use (EDAW, 1996). Hypothetical future residential use is also included to evaluate unrestricted land use.

9.1.1 Future Commercial/Industrial Worker

The site cancer risk for the hypothetical future commercial/industrial worker posed by COPCs in surface soils is well below EPA's acceptable cancer risk range of 10^{-6} to 10^{-4} and DTSC's target cancer risk of 10^{-5} used for commercial land-use settings. The site non-cancer HI for the hypothetical future commercial/industrial worker posed by COPCs in surface soils is well below EPA's and DTSC's target HI of 1. Thus, COPCs in surface soils would not pose a significant cancer risk/non-cancer hazard to the hypothetical future commercial population, which is the most likely future-use scenario. As noted previously, subsurface soils and groundwater were not complete pathways for the hypothetical future commercial population, and thus cancer risks/non-cancer hazards were not calculated.

9.1.2 Future Construction Worker

The site and background cancer risks are at the lower end of EPA's acceptable cancer risk range of 10^{-6} to 10^{-4} and below the cancer risk of 10^{-5} typically used by DTSC for commercial land-use settings, and the estimated incremental cancer risk is well below both EPA and DTSC criteria. The site and incremental non-cancer HI for the hypothetical future construction worker posed by COPCs in surface soils is below EPA's and DTSC's target HI of 1. Thus, COPCs in soils would not pose a significant cancer risk and non-cancer hazard to the hypothetical future construction worker.

9.1.3 Future Residents

Based on the site and incremental cancer risks and non-cancer HIs for both surface and subsurface soils, COPCs in soils would pose no significant cancer risk/non-cancer hazard to the hypothetical future residential population. However, based on the site and incremental cancer risk and non-cancer HI for groundwater, COPCs in groundwater could pose a significant cancer risk and non-cancer hazard to a hypothetical future resident that consumes water directly from the shallow groundwater aquifer.

The groundwater exposure area assessed in this HHRA is not, however, representative of the actual exposure a residential receptor would likely have, as residential use would likely be supplied with municipal water supply. Should IWTP 360 groundwater improbably be used as a source of drinking water, risk is likely overestimated. Hypothetical future drinking water use would require grouping enough low-yield wells together to result in a usable amount of water at a resident's tap. (Under EPA groundwater classification guidelines, 150 gallons per day must be extracted from an aquifer to provide whole-house use to a family of three). This would result in drawing in more groundwater from wells (over a wider footprint), which may be less contaminated than those evaluated for IWTP 360. For this reason, the groundwater EPC may not be a true representation of the actual drinking water exposure pathway.

9.1.4 Ecological Receptors

A site-specific ERA was conducted for IR Site 4, of which IWTP 360 is a part, to estimate potential risks to the environment (Appendix D). Because the OU-2B groundwater plume intersects the Seaplane Lagoon, the exposure pathways for marine receptors were considered complete, and IR Site 4 was included in a site-specific ERA conducted for the OU-2B groundwater plume to estimate potential risks to marine receptors.

Results of the ERA for Site 4 indicate a potential risk to small mammals and raptors from lead (a COPC for IWTP 360), of passerines and raptors from silver (a COPC for IWTP 360), and of mammals from copper (not a COPC for IWTP 360) and silver. However, the risk of exposure to these chemicals was determined to be low based on the lack of habitat for these receptor populations at Site 4. For groundwater within the OU-2B plume, manganese (not a COPC for IWTP 360) may present a risk to marine receptors. However, this risk was also expected to be low.

9.2 SUMMARY OF ONGOING CERCLA CLEANUP ACTIVITIES IN THE VICINITY OF IWTP 360

Based on the 2000 Federal Facilities Agreement between the Navy and DTSC, any required cleanup of groundwater beneath the IWTP 360 RCRA unit would be deferred to and addressed under the CERCLA program. The following subsection presents a brief discussion of the ongoing CERCLA groundwater program being conducted at Alameda Point and the proposed Data Gap Investigation of Building 360 with respect to the IWTP 360 site.

Groundwater monitoring wells in the vicinity of IWTP 360 are included in the Basewide Long-Term Groundwater Monitoring Program as part of the IR Site 3 Group (Figure 5). Groundwater monitoring wells at IR Site 3 Group are analyzed semiannually for TPH by EPA Method 8015B, VOCs by EPA Method 8260B, and Dissolved Metals by EPA Methods 6010B/6020A/7470A. Arsenic, chromium, lead, nickel, selenium, and thallium have been detected in First Water Bearing Zone (FWBZ) wells at concentrations exceeding both maximum contaminant levels (MCLs) and background values. Arsenic, copper, lead, and nickel are present in FWBZ wells at concentrations exceeding AWQCs and background values. Copper and nickel concentrations above AWQCs were also common in Second Water Bearing Zone (SWBZ) groundwater samples. Infrequent detections of antimony, arsenic, lead, selenium, and thallium above the MCLs have also been found in samples collected from SWBZ wells. Above-background concentrations of arsenic, chromium, lead, and the most elevated nickel concentrations appeared to be restricted to only a few FWBZ wells. A more comprehensive discussion and presentation of the Spring 2006 IR Site 3 Group results are presented in the Draft Spring 2006 Alameda Basewide Annual Groundwater Monitoring Report (ITSI, 2006).

With respect to ongoing sampling of monitoring wells in the immediate vicinity of IWTP 360, the Spring 2006 results of selected dissolved metals (IWTP 360 COPCs arsenic, chromium, and nickel) in several wells in the FWBZ and SWBZ are presented in Figure 6. In the shallow groundwater near Building 360, elevated concentrations of chromium (M04-05) and nickel (MW360-1) are located upgradient and elevated concentrations of arsenic (M03-06) are located crossgradient of the IWTP 360 site. These groundwater concentrations are consistent with a metals source inside (or underlying) Building 360. It is likely they are related to the chromium-nickel plating operations known to have occurred in Building 360. Second water-bearing zone well D03-03, also in the vicinity of Building 360 and upgradient of IWTP 360, had significantly elevated concentrations of both chromium (21,000 ug/L) and nickel (39,000 ug/L) in samples collected during the Spring 2006 Basewide groundwater sampling event. This SWBZ well had not previously been sampled for metals prior to the Spring 2006 event. Further subsurface investigation within and around the footprint of Building 360 may be appropriate to further delineate possible metals contamination in groundwater and to verify that plating operations within Building 360 are the probable source. In addition, hexavalent chromium (an IWTP 360 COPC) should be added to the analytical suite for wells in the immediate vicinity.

A Data Gap Investigation for OU-1, OU-2A, and OU-2B, which includes assessment of Building 360's former plating operations, is currently being developed. The investigation will include a groundwater evaluation of metals in the FWBZ and SWBZ within and around the vicinity of Building 360, located less than 150 feet east and hydraulically upgradient of IWTP 360.

9.3 RECOMMENDATIONS

The investigations conducted at IWTP 360 have adequately characterized the soil and groundwater conditions of the former IWTP 360 and along the underground pipelines from Building 360 to IWTP 360. No additional sampling under RCRA is recommended.

9.3.1 Soil

No further evaluation of soil at IWTP 360 is recommended based on the risk management discussion presented in Sections 9.1.1 through 9.1.3.

9.3.2 Groundwater

No further evaluation of groundwater at IWTP 360 is recommended based on the risk management discussion presented in Section 9.1.1.

9.4 CLOSURE PERFORMANCE STANDARDS

The following sections present the results of closure evaluations that were conducted on IWTP 360 with respect to tanks and associated piping (Section 9.3.1), soil (Section 9.3.2), and groundwater (Section 9.3.3). In addition, Section 9.3.4 (Closure Recommendation) summarizes those results and demonstrates that the Navy has met the closure performance standards for IWTP 360, as stated in the approved Amendment to the Closure Plan for IWTP 360 (Tetra Tech, 2004a).

The Navy performed closure activities at IWTP 360 in accordance with the requirements for closure of hazardous waste units listed in the California Code of Regulations (CCR) Title 22 Section 66264.111. The requirements of Sections 66264.111 are presented below with annotations (in italics) that document how the Navy has addressed each of the requirements. Section 66264.111: The owner or operator shall close the facility in a manner that:

a) minimizes the need for further maintenance

The Navy met this requirement by removing all equipment, tanks and related piping such that no further maintenance is needed.

b) controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated rainfall or run-off, or waste decomposition products to the ground or surface waters or to the atmosphere

The Navy met this requirement by removing hazardous waste constituents from the site and conducting soil and groundwater sampling and risk assessments that demonstrated acceptable risk to human health and the environment.

c) complies with the closure requirements in sections 66264.178 (Closure of Containment System) and 66264.197 (Closure and Post-closure Care of Tanks)

The Navy removed all waste residues, containers, piping, and related equipment and structures. All wastes generated during closure activities were disposed of in accordance with applicable regulations. No contaminated soils were identified in the HHRA. The closure plan and amendment to the closure plan were approved by DTSC.

9.4.1 Tanks and Associated Piping

Removal of tanks and associated piping at IWTP 360 was conducted in 1996/1997 (E&E, 1997) and in 2000 (IT, 2001b). All tanks, units, and piping were dismantled and transported for disposal or recycling. Refer to Section 2.3 for descriptions of the removal activities. The Navy met the closure performance standards and no further action is required for the tanks and associated piping.

9.4.2 Soil

The Navy conducted a HHRA with validated data from soil samples and performed a risk management evaluation and determined that no further action is required.

9.4.3 Groundwater

The Navy conducted a HHRA with validated data from groundwater samples and performed a risk management evaluation and determined that no further action is required.

9.4.4 Closure Recommendation

The closure performance standards in the approved amendment to the closure plan for IWTP 360 (Tetra Tech, 2004a) have been met. Based on the above findings, previous investigations, and deferral of any potential future groundwater remediation into the existing CERCLA program (under the terms of the 2000 FFA), closure of IWTP 360 with no post-closure requirements is recommended.

No further action is recommended for IWTP 360 with unrestricted future reuse. The Navy will submit certification to DTSC from both the Commanding Officer and an independent, California-registered professional engineer. The closure certification report will state that IWTP 360 has been closed in accordance with the closure plan and amendments and will request closure of IWTP 360 with no post-closure requirements.

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TABLES

REVISED
AMENDMENT TO CLOSURE SUMMARY REPORT
INDUSTRIAL WASTE TREATMENT PLANT 360

DATED 01 JANUARY 2007

STEP 1: State the Problem

- The primary objective of the closure confirmation sampling at IWTP 360 is to obtain closure for IWTP 360.
- A second objective is to further define the lateral and vertical extent of contamination in soil and groundwater in the vicinity of IWTP 360.
- A third objective is to evaluate whether soil or groundwater contamination occurred as a result of possible leaks from the underground pipelines.

STEP 2: Identify the Decisions

Are any of the target constituents present at concentrations above PRGs in subsurface soils or above MCLs in groundwater in the vicinity of IWTP 360 or along the pipelines from Building 360 to IWTP 360?

STEP 3: Identify Inputs to the Decisions

- Analytical results for soil samples collected from one to two soil direct-push locations east of the former excavation area within IWTP 360; samples to be collected at 1.5 to 2.0 feet bgs and 7.5 to 8.0 feet bgs or at the groundwater interface, whichever is shallower.
- Analytical results for groundwater samples collected from two depths within the first water bearing zone from each of the three direct-push locations in the vicinity of IWTP 360 (situated north, west, and east of the former excavation area).
- Analytical results for soil samples collected at two depths (3 feet and 5 feet bgs) from each of the six locations along the pipelines from Building 360 to IWTP 360.
- Analytical results for groundwater samples collected at one depth (5 feet bgs) from each of the six locations along the pipelines from Building 360 to IWTP 360.
- All soil and groundwater samples will be analyzed for cadmium, chromium, copper, lead, nickel, and silver.

STEP 4: Define Study Boundaries

- For the soil samples in the vicinity of IWTP 360, the lateral extent of the study area is the eastern side of Building 414 (located just to the east of IWTP 360).
- The vertical extent of the soil study area in the vicinity of IWTP 360 extends from the surface of the soil to 8 feet bgs (or at the groundwater interface, whichever is shallower) for the two locations east of the former excavation area.
- For the groundwater samples in the vicinity of IWTP 360, the lateral extent of the study area is the perimeter of IWTP 360, and the vertical extent extends to the maximum depth of groundwater in the first water-bearing zone (approximately 12 feet).
- For the soil and groundwater samples along the pipelines from Building 360 to IWTP 360, the lateral extent of the study is within 5 feet of the underground pipelines and the vertical extent extends 5 feet bgs, which is about 2 feet below the depth of the pipelines.
- Temporal boundaries extend through the period of performance of the task order.

STEP 5: Develop Decision Rules

If concentrations of metals in soil and groundwater are below background and MCLs in the vicinity of IWTP 360 or along the pipelines from Building 360 to IWTP 360, then the data will be used to support a clean closure decision for IWTP 360.

If concentrations of metals are detected above background and MCLs in soil and groundwater samples collected in the vicinity of IWTP 360 or along the pipelines from Building 360 to IWTP 360, a human health risk assessment will be conducted.

STEP 6: Specify Tolerable Limits on Decision Errors

Site-specific sampling objectives and the media being investigated limit the use of statistical methods in selecting sampling locations for this investigation. Sampling locations will be based on prior knowledge

of likely hazardous material handling and waste disposal. Tolerable limits on decision errors cannot be precisely defined.
STEP 7: Optimize the Sampling Design
Two locations in the vicinity of IWTP 360 selected for soil sampling are based on knowledge of historical operations; therefore, soil sampling locations are placed using professional judgment. Three locations in the vicinity of IWTP 360 selected for groundwater sampling are based on knowledge of historical operations; therefore, soil sampling locations are placed using professional judgment. Six locations along the pipelines from Building 360 to IWTP 360 for soil and groundwater sampling are placed at about 25-foot intervals along the length of the pipelines, taking into account the previous sampling locations.

Notes:

bgs	Below ground surface
IWTP	Industrial waste treatment plant
MCL	Maximum contaminant level
PRG	Preliminary Remediation Goal

TABLE 2: PREVIOUS INVESTIGATION SOIL AND GROUNDWATER SAMPLE SUMMARY, VICINITY OF IWTP 360

Amendment to Closure Summary Report IWTP 360

						ANALYSES PERFORMED												
SAMPLING LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	MATRIX	*DEPTH* (ft bgs)	REMOVED? Y/N	SVOC	VOC	Cadmium	Chromium	*Hexavalent* Chromium	Lead	Total Metals	General Chemistry	TPH	Phenols	Cyanide	Sulfide	TRPH
REMEDIAL INVESTIGATION																		
Environmental Baseline Survey, Phase 2A (IT 2001a)																		
134-004-014	134-0014	4/4/95	Soil	3-4.5	NO	--	X	--	--	--	--	X	X	X	--	X	X	--
	134-0014M	4/4/95	Soil	3.5-4	NO	--	--	--	--	--	--	X	--	X	--	--	--	--
	134-0014RE	4/4/95	Soil	3-4.5	NO	X	--	--	--	--	--	--	--	--	--	--	--	--
	134-0039	4/4/95	Soil	3-4.5	NO	--	X	--	--	--	--	X	X	X	--	X	X	--
	134-0039RE	4/4/95	Soil	4-4.5	NO	X	--	--	--	--	--	--	--	--	--	--	--	--
134-004-015	134-0015	4/11/95	Soil	2-2.5	NO	X	X	--	--	--	--	--	X	--	--	X	X	--
	134-0015M	4/11/95	Soil	2.5-3	NO	--	--	--	--	--	--	X	--	X	--	--	--	--
	134-0040	4/11/95	Soil	2-2.5	NO	X	X	--	--	--	--	--	X	--	--	X	X	--
163-001	030-USTF-071	9/2/99	Water	10	NO	--	X	--	--	--	--	--	--	--	--	--	--	--
	163-0015	8/19/99	Water	5-12	NO	--	X	--	--	--	X	--	--	X	--	--	--	--
IT Corporation IWTP (IT 2001b)																		
IWTP-360-01	360-CS-001	8/24/00	Soil	6-6.5	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-002	8/25/00	Soil	6-6.5	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-003	8/24/00	Soil	8.75-9.25	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-004	8/24/00	Soil	8.75-9.25	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-005	8/24/00	Soil	10-10.66	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-006	8/25/00	Soil	10-10.66	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-007	8/24/00	Soil	11.33-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-008	8/25/00	Soil	11.33-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-009	7/14/99	Soil	13.33-14	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-010	7/14/99	Soil	13.33-14	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-02	360-CS-011	7/14/99	Soil	6.5-6.8	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-012	7/13/99	Soil	7.7-8	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-013	7/14/99	Soil	10-10.2	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-014	7/14/99	Soil	11.7-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-015	7/14/99	Soil	13.7-14	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-03	360-CS-016	7/13/99	Soil	6-6.5	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-017	7/13/99	Soil	7.7-8	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-018	8/24/00	Soil	9.7-10	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-019	8/24/00	Soil	11.7-12	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-020	8/24/00	Soil	13.7-14	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-04	360-CS-031	8/24/00	Soil	7-7.3	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-032	8/24/00	Soil	7.7-8	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-033	8/25/00	Soil	10.7-11	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-034	8/25/00	Soil	11.7-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-035	8/25/00	Soil	13.7-14	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-05	360-CS-036	8/25/00	Soil	6-6.3	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-037	8/25/00	Soil	8-8.3	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-038	8/25/00	Soil	10-10.3	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-039	8/24/00	Soil	12-12.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-040	8/24/00	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-06	360-CS-041	8/25/00	Soil	6.5-6.8	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-042	8/24/00	Soil	8-8.3	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-043	8/24/00	Soil	10-10.3	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-044	8/24/00	Soil	12-12.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-045	8/25/00	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-07	360-CS-021	8/25/00	Soil	6-6.3	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-022	8/24/00	Soil	7.7-8	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-023	8/24/00	Soil	9.7-10	YES	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-024	8/24/00	Soil	11.7-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-025	8/24/00	Soil	13.7-14	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-08	360-CS-026	8/24/00	Soil	5.7-6	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-027	8/24/00	Soil	7.7-8	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-028	8/24/00	Soil	9.7-10	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-029	8/24/00	Soil	11.7-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-030	8/25/00	Soil	13.7-14	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-09	360-CS-091	8/25/00	Soil	6-6.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-092	8/25/00	Soil	7.7-8	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-093	8/24/00	Soil	10-10.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-094	8/25/00	Soil	11.7-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-095	8/25/00	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-10	360-CS-086	8/25/00	Soil	6-6.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-087	8/24/00	Soil	7.7-8	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-088	8/25/00	Soil	10-10.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-089	8/25/00	Soil	11.7-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-090	7/12/99	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-11	360-CS-096	8/25/00	Soil	6-6.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-12	360-CS-071	8/24/00	Soil	7-7.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-072	8/24/00	Soil	8-8.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-073	8/24/00	Soil	10-10.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-074	8/24/00	Soil	12-12.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-075	7/13/99	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-13	360-CS-056	7/12/99	Soil	6.3-6.6	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-057	8/24/00	Soil	8-8.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-058	8/24/00	Soil	10-10.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-059	8/24/00	Soil	12-12.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-060	8/24/00	Soil	14.3-14.6	NO	--	--	X	X	--	--	--	--	--	--	--	--	--

TABLE 2: PREVIOUS INVESTIGATION SOIL AND GROUNDWATER SAMPLE SUMMARY, VICINITY OF IWTP 360

Amendment to Closure Summary Report IWTP 360

SAMPLING LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	MATRIX	DEPTH (ft bgs)	REMOVED? Y/N	ANALYSES PERFORMED SVOC	VOC	Cadmium	Chromium	Hexavalent Chromium	Lead	Total Metals	General Chemistry	TPH	Phenols	Cyanide	Sulfide	TRPH
IT Corporation IWTP (IT 2001b)																		
IWTP-360-14	360-CS-046	8/24/00	Soil	6.3-6.6	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-047	8/24/00	Soil	8-8.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-048	8/24/00	Soil	11-11.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-049	8/25/00	Soil	12-12.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-050	8/25/00	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-15	360-CS-097	8/25/00	Soil	6-6.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-098	8/25/00	Soil	7.7-8	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-099	8/25/00	Soil	10-10.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-100	8/25/00	Soil	11.7-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-101	8/24/00	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-16	360-CS-102	8/24/00	Soil	6-6.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-103	8/25/00	Soil	7.7-8	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-104	8/24/00	Soil	10-10.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-105	8/24/00	Soil	11.7-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-106	8/25/00	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-17	360-CS-061	8/24/00	Soil	6.3-6.6	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-062	8/25/00	Soil	6.6-7	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-063	7/13/99	Soil	8.3-8.5	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-064	7/13/99	Soil	8.5-8.7	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-065	8/24/00	Soil	10-10.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-066	8/24/00	Soil	10.3-10.6	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-067	8/24/00	Soil	12-12.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-068	8/24/00	Soil	12.6-14	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-069	8/24/00	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-070	8/24/00	Soil	14.3-14.6	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-18	360-CS-051	8/24/00	Soil	6.5-6.8	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-052	8/24/00	Soil	8-8.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-053	8/24/00	Soil	10-10.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-054	8/25/00	Soil	12-12.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-055	8/25/00	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-19	360-CS-076	8/25/00	Soil	6-6.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-077	8/24/00	Soil	7.7-8	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-078	8/25/00	Soil	10-10.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-079	8/25/00	Soil	11.7-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-080	8/25/00	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
IWTP-360-20	360-CS-081	8/24/00	Soil	6-6.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-082	8/25/00	Soil	7.7-8	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-083	8/25/00	Soil	10-10.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-084	8/24/00	Soil	11.7-12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	360-CS-085	8/25/00	Soil	14-14.3	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
Data Gap Sampling (Tetra Tech 2002b)																		
S04-DGS-DP21	385-S04-075	7/9/2001	Water	7	NO	--	--	X	X	X	--	--	X	--	--	--	--	--
	385-S04-076	7/10/01	Water	12	NO	--	--	X	X	--	--	--	--	--	--	--	--	--
	385-S04-076A	7/10/2001	Water	12	NO	--	--	--	--	X	--	--	X	--	--	--	--	--
Ecology and Environment (E&E 1997)																		
B2	B2-1	7/1/1997	Soil	1	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
	B2-2	7/1/1997	Soil	2	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
	B2-4	7/1/1997	Soil	4	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
B3	B3-6	7/1/1997	Soil	6	YES	--	X	--	--	--	--	X	--	--	X	X	--	X
	B3-10	7/1/1997	Soil	10	YES	--	X	--	--	--	--	X	--	--	X	X	--	X
B4	B4-1	7/1/1997	Soil	1	YES	--	X	--	--	--	--	X	--	--	X	X	--	X
	B4-6	7/1/1997	Soil	6	YES	--	X	--	--	--	--	X	--	--	X	X	--	X
	B4-8	7/1/1997	Soil	8	YES	--	X	--	--	--	--	X	--	--	X	X	--	X
	B4-10	7/1/1997	Soil	10	YES	--	X	--	--	--	--	X	--	--	X	X	--	X
B5	B5-1	7/1/1997	Soil	1	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
	B5-2	7/1/1997	Soil	2	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
	B5-4	7/1/1997	Soil	4	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
B6	B6-1	7/1/1997	Soil	1	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
	B6-2	7/1/1997	Soil	2	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
	B6-4	7/1/1997	Soil	4	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
B7	B7-1	7/1/1997	Soil	1	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
	B7-2	7/1/1997	Soil	2	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
	B7-4	7/1/1997	Soil	4	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
B8	B8-1	7/1/1997	Soil	1	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
	B8-6	7/1/1997	Soil	6	NO	--	X	--	--	--	--	X	--	--	X	X	--	X
	B8-10	7/1/1997	Soil	10	NO	--	X	--	--	--	--	X	--	--	X	X	--	X

Notes:

--	These analyses were not performed.	SVOC	Semivolatile organic compound
X	These analyses were performed.	TOC	Total organic carbon
ft bgs	Feet below ground surface	TPH	Total petroleum hydrocarbon
General chemistry	Percent moisture, TOC and/or pH	TRPH	Total recoverable petroleum hydrocarbons
PCB	Polychlorinated biphenyl	VOC	Volatile organic compound
PAH	Polynuclear aromatic hydrocarbon		

TABLE 3: PREVIOUS INVESTIGATION SOIL AND GROUNDWATER SAMPLE SUMMARY, PIPELINES TO IWTP 360

Amendment to Closure Summary Report IWTP 360

SAMPLING LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	MATRIX	DEPTH (ft bgs)	REMOVED? Y/N	ANALYSES PERFORMED: SVOC	VOC	Cadmium	Chromium	Hexavalent Chromium	Lead	Total Metals	General Chemistry	TPH	Phenols	Cyanide	Sulfide	TRPH
REMEDIAL INVESTIGATION																		
Data Gap Sampling (Tetra Tech 2002b)																		
S04-DGS-VE04	385-S04-305	4/26/2002	Soil	3-3.5	NO	--	--	--	X	X	--	--	X	--	--	X	--	--
	385-S04-305A	4/26/2002	Soil	3-3.5	NO	--	--	--	--	--	--	X	X	--	--	--	--	--
	385-S04-306	4/26/2002	Soil	5-5.5	NO	--	--	--	X	X	--	--	X	--	--	X	--	--
	385-S04-306A	4/26/2002	Soil	5-5.5	NO	--	--	--	--	--	--	X	X	--	--	--	--	--
	385-S04-307	4/26/2002	Water	7	NO	--	--	--	--	X	--	--	--	--	--	X	--	--
	385-S04-307A	4/26/2002	Water	7	NO	--	--	--	--	--	--	X	--	--	--	--	--	--
S04-DGS-VE05	385-S04-308	4/26/2002	Soil	3-3.5	NO	--	--	--	X	X	--	--	X	--	--	X	--	--
	385-S04-308A	4/26/2002	Soil	3-3.5	NO	--	--	--	--	--	--	X	X	--	--	--	--	--
	385-S04-309	4/26/2002	Soil	5-5.5	NO	--	--	--	X	X	--	--	X	--	--	X	--	--
	385-S04-309A	4/26/2002	Soil	5-5.5	NO	--	--	--	--	--	--	X	X	--	--	--	--	--
	385-S04-310	4/26/2002	Water	7	NO	--	--	--	X	X	--	--	--	--	--	X	--	--
	385-S04-310A	4/26/2002	Water	7	NO	--	--	--	--	--	--	X	--	--	--	--	--	--
S04-DGS-VE06	385-S04-311	4/26/2002	Soil	3-3.5	NO	--	--	--	X	X	--	--	X	--	--	X	--	--
	385-S04-311A	4/26/2002	Soil	3-3.5	NO	--	--	--	--	--	--	X	X	--	--	--	--	--

Notes:

--	These analyses were not performed.	SVOC	Semivolatile organic compound
X	These analyses were performed.	TOC	Total organic carbon
ft bgs	Feet below ground surface	TPH	Total petroleum hydrocarbon
General chemistry	Percent moisture, TOC and/or pH	TRPH	Total recoverable petroleum hydrocarbons
PCB	Polychlorinated biphenyl	VOC	Volatile organic compound
PAH	Polynuclear aromatic hydrocarbon		

TABLE 4: CURRENT INVESTIGATION SOIL AND GROUNDWATER SAMPLE SUMMARY, VICINITY OF IWTP 360

Amendment to Closure Summary Report IWTP 360

SAMPLING LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	MATRIX	DEPTH (ft bgs)	REMOVED? Y/N	ANALYSES PERFORMED												
						SVOC	VOC	Cadmium	Chromium	Hexavalent Chromium	Lead	Total Metals	General Chemistry	TPH	Phenols	Cyanide	Sulfide	TRPH
REMEDIAL INVESTIGATION																		
Closure Confirmation Sampling																		
IWTP360-DP01	033-IWTP360-001	3/3/2004	Soil	1.5-2	NO	--	--	--	--	X		X	X	--	--	--	--	--
	033-IWTP360-002	3/3/2004	Soil	4.5-5	NO	--	--	--	--	X		X	X	--	--	--	--	--
IWTP360-DP02	033-IWTP360-003	3/3/2004	Soil	1.5-2	NO	--	--	--	--	X		X	X	--	--	--	--	--
	033-IWTP360-004	3/3/2004	Soil	4.5-5	NO	--	--	--	--	X		X	X	--	--	--	--	--
	033-IWTP360-005	3/4/2004	Water	4-5	NO	--	--	--	--	X		X	--	--	--	--	--	--
	033-IWTP360-006	3/4/2004	Water	10-12	NO	--	--	--	--	X		X	--	--	--	--	--	--
IWTP360-DP03	033-IWTP360-007	3/3/2004	Water	5-6	NO	--	--	--	--	X		X	--	--	--	--	--	--
	033-IWTP360-008	3/3/2004	Water	8-10	NO	--	--	--	--	X		X	--	--	--	--	--	--
IWTP360-DP04	033-IWTP360-009	3/3/2004	Water	5-7	NO	--	--	--	--	X		X	--	--	--	--	--	--
	033-IWTP360-011	3/3/2004	Water	5-7	NO	--	--	--	--	X		X	--	--	--	--	--	--

Notes:

--	These analyses were not performed.	SVOC	Semivolatile organic compound
X	These analyses were performed.	TOC	Total organic carbon
ft bgs	Feet below ground surface	TPH	Total petroleum hydrocarbon
General chemistry	Percent moisture, TOC and/or pH	TRPH	Total recoverable petroleum hydrocarbons
PCB	Polychlorinated biphenyl	VOC	Volatile organic compound
PAH	Polynuclear aromatic hydrocarbon		

TABLE 5: CURRENT INVESTIGATION SOIL AND GROUNDWATER SAMPLE SUMMARY, PIPELINES TO IWTP 360

Amendment to Closure Summary Report IWTP 360

Page 1 of 1

SAMPLING LOCATION	SAMPLE IDENTIFICATION	DATE SAMPLED	MATRIX	DEPTH (ft bgs)	REMOVED? Y/N	ANALYSES PERFORMED												
						SVOC	VOC	Cadmium	Chromium	Hexavalent Chromium	Lead	Total Metals	General Chemistry	TPH	Phenols	Cyanide	Sulfide	TRPH
REMEDIAL INVESTIGATION																		
Closure Confirmation Sampling																		
IWTP360-DP05	033-IWTP360-034	3/5/2004	Soil	1.5-2	NO	--	--	--	--	X		X	X	--	--	--	--	
	033-IWTP360-035	3/5/2004	Soil	4-4.5	NO	--	--	--	--	X		X	X	--	--	--	--	
	033-IWTP360-036	3/5/2004	Water	8-10	NO	--	--	--	--	X		X	--	--	--	--	--	
IWTP360-VE01	033-IWTP360-012	3/4/2004	Soil	3-3.5	NO	--	--	--	--	X		X	X	--	--	--	--	
	033-IWTP360-013	3/4/2004	Soil	4-4.5	NO	--	--	--	--	X		X	X	--	--	--	--	
IWTP360-VE02	033-IWTP360-015	3/4/2004	Soil	3-3.5	NO	--	--	--	--	X		X	X	--	--	--	--	
IWTP360-VE03	033-IWTP360-018	3/4/2004	Soil	2.5-3	NO	--	--	--	--	X		X	X	--	--	--	--	
	033-IWTP360-019	3/5/2004	Soil	4.16-4.66	NO	--	--	--	--	X		X	X	--	--	--	--	
	033-IWTP360-020	3/5/2004	Water	7-9	NO	--	--	--	--	X		X	--	--	--	--	--	
IWTP360-VE04	033-IWTP360-021	3/4/2004	Soil	3-3.5	NO	--	--	--	--	X		X	X	--	--	--	--	
	033-IWTP360-022	3/4/2004	Soil	4-4.5	NO	--	--	--	--	X		X	X	--	--	--	--	
	033-IWTP360-023	3/5/2004	Water	8-10	NO	--	--	--	--	X		X	--	--	--	--	--	
IWTP360-VE05	033-IWTP360-024	3/5/2004	Soil	2.5-3	NO	--	--	--	--	X		X	X	--	--	--	--	
	033-IWTP360-025	3/5/2004	Soil	4.5-5	NO	--	--	--	--	X		X	X	--	--	--	--	
IWTP360-VE06	033-IWTP360-027	3/5/2004	Soil	2.5-3	NO	--	--	--	--	X		X	X	--	--	--	--	
	033-IWTP360-028	3/5/2004	Soil	4.5-5	NO	--	--	--	--	X		X	X	--	--	--	--	
	033-IWTP360-029	3/5/2004	Water	8-10	NO	--	--	--	--	X		X	--	--	--	--	--	
	033-IWTP360-030	3/5/2004	Water	8-10	NO	--	--	--	--	X		X	--	--	--	--	--	

Notes:

--	These analyses were not performed.	SVOC	Semivolatile organic compound
X	These analyses were performed.	TOC	Total organic carbon
ft bgs	Feet below ground surface	TPH	Total petroleum hydrocarbon
General chemistry	Percent moisture, TOC and/or pH	TRPH	Total recoverable petroleum hydrocarbons
PCB	Polychlorinated biphenyl	VOC	Volatile organic compound
PAH	Polynuclear aromatic hydrocarbon		

Table 6: Chemicals of Potential Concern and Background Metals Values

Amendment to Closure Summary Report IWTP 360

Site Surface Soils (0-1 Foot)		Site Subsurface Soils (0-10 Feet)		Groundwater	
COPC(1)	EPC(1) (mg/kg)	COPC(1)	EPC(1) (mg/kg)	COPC(1)	EPC(1) (mg/L)
Barium	5.95E+01	Barium	3.35E+01	Arsenic	2.35E-02
—		Calcium	3.91E+03	Calcium	7.46E+01
Chromium	3.42E+01	Chromium	6.16E+01	Chromium	6.83E-02
—		Chromium VI	1.32E+00	Chromium VI	2.00E-02
Cobalt	6.22E+00	Cobalt	2.06E+00	Nickel	2.84E-02
Lead	5.00E+00	Lead	2.34E+01	Vanadium	2.96E-02
—		Molybdenum	5.10E+00	Zinc	2.27E-02
Nickel	4.26E+01	Nickel	2.76E+01		
—		Silver	1.05E+01		

"Blue Background" Soil		Background Groundwater	
Metal	EPC(2) (mg/kg)	Metal	EPC(2) (mg/L)
Aluminum	7.07E+03	Aluminum	4.02E-01
Arsenic	6.39E+00	Arsenic	9.88E-03
Barium	6.33E+01	Barium	1.85E-01
Beryllium	4.95E-01	Cadmium	1.29E-03
Cadmium	4.95E-01	Chromium	5.61E-03
Chromium	3.57E+01	Cr VI	4.00E-03
Cobalt	6.45E+00	Lead	2.39E-03
Copper	1.52E+01	Manganese	1.37E+00
Lead	7.54E+00	Molybdenum	6.41E-03
Manganese	1.60E+02	Nickel	1.27E-02
Nickel	3.16E+01	Vanadium	1.03E-02
Silver	1.88E+00		
Vanadium	2.37E+01		
Zinc	3.09E+01		

(1) COPCs and EPCs from Table 1 (Soil) and Table 2 (Groundwater), Appendix B, Site Data Versus Background Data Evaluation.

(2) Background metals and EPCs from Summary of Background Concentrations in Soil and Groundwater, Alameda Point, Alameda, California as re-calculated by TtEMI in Tables 3.1 and 3.2.

Table 7: Summary of Risks and Hazard Indices

Amendment to Closure Summary Report IWTP 360

Scenario	Metals Contributing to Site Risk or HI[(1)]	Calculated Site Risk (using COPCs only)			Calculated Background Risk (using background data)			Estimated Incremental Risk (site risk minus background risk)		
		Risk	HI		Risk	HI		Risk	HI	
		Combined	*Adult*	*Child*	*Combined*	*Adult*	*Child*	*Combined*	*Adult*	*Child*
Future Residential										
Surface Soils	—	1.13E-08	0.005	0.04	1.04E-04	0.09	0.85	None	None	None
Groundwater	As	3.35E-03	3.20	7.48	1.40E-03	2.97	6.94	1.94E-03	0.23	0.54
Surface Soils and Groundwater	As	3.35E-03	3.21	7.52	1.51E-03	3.06	7.79	1.84E-03	0.14	None
Subsurface Soils	—	8.09E-08	0.01	0.07	1.04E-04	0.09	0.85	None	None	None
Groundwater	As	3.35E-03	3.20	7.48	1.40E-03	2.97	6.94	1.94E-03	0.23	0.54
Subsurface Soils and Groundwater	As	3.35E-03	3.21	7.55	1.51E-03	3.06	7.79	1.84E-03	0.15	None
Future Commercial/Industrial										
Surface Soils	—	3.71E-09	0.003	NA	2.36E-05	0.07	NA	None	None	NA
Surface Soils Only		3.71E-09	0.003	NA	2.36E-05	0.07	NA	None	None	NA
Future Construction Worker										
Surface Soils	—	2.79E-07	0.90	NA	3.69E-06	2.74	NA	None	None	NA
Groundwater	As	2.51E-06	0.09	NA	1.05E-06	0.08	NA	1.46E-06	0.01	NA
Surface Soils and Groundwater	As	2.79E-06	0.99	NA	4.74E-06	2.82	NA	None	None	NA
Subsurface Soils	—	2.00E-06	0.53	NA	3.69E-06	2.74	NA	None	None	NA
Groundwater	As	2.51E-06	0.09	NA	1.05E-06	0.08	NA	1.46E-06	0.01	NA
Subsurface Soils and Groundwater	As	4.51E-06	0.62	NA	4.74E-06	2.82	NA	None	None	NA

(1) A metal is considered contributing to the risk or HI if the individually calculated risk is greater than or equal to 1.0E-06 or HI greater than 1.

FIGURES

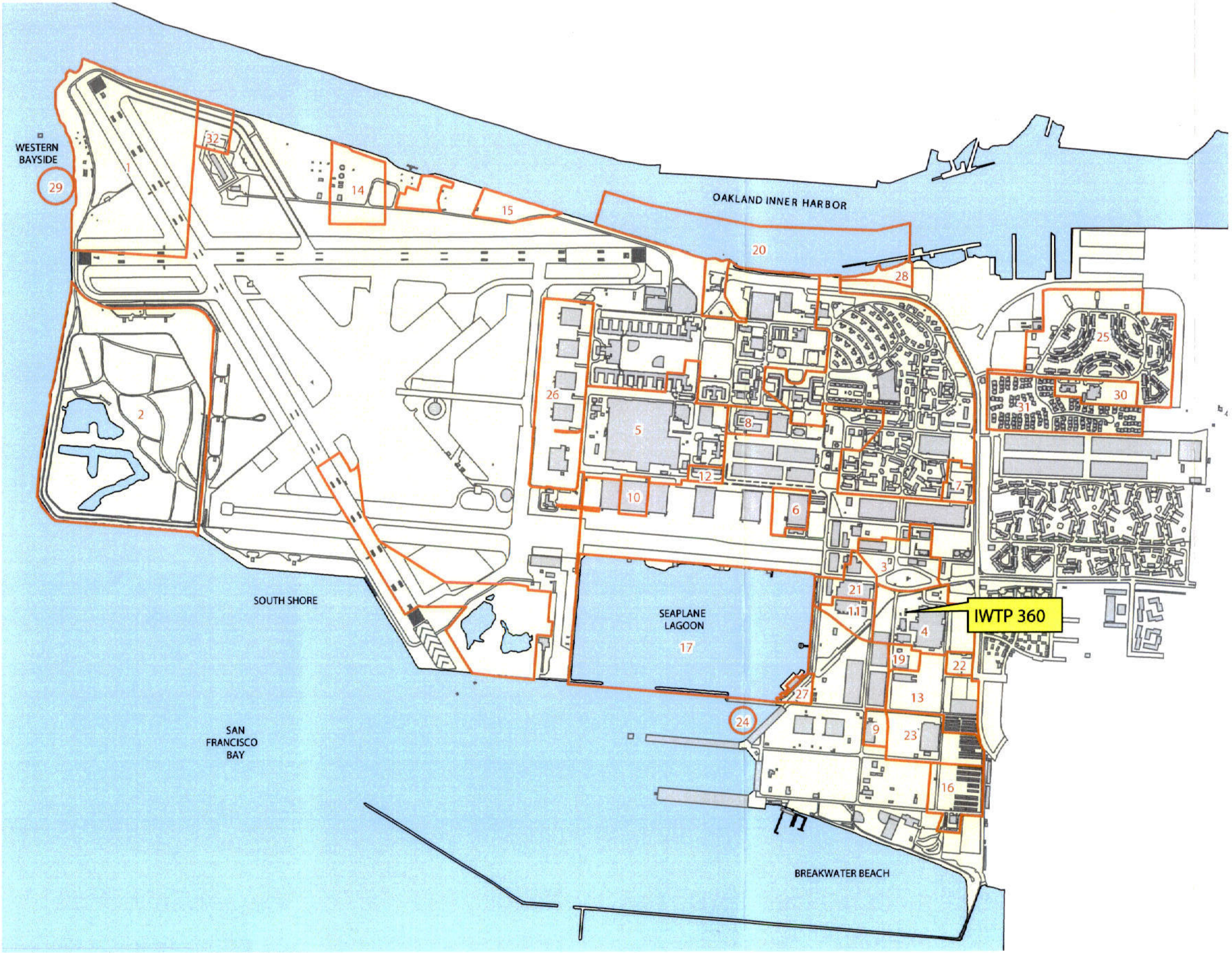
REVISED
AMENDMENT TO CLOSURE SUMMARY REPORT
INDUSTRIAL WASTE TREATMENT PLANT 360

DATED 01 JANUARY 2007

Source: *"Pre-Draft Amendment to Closure Summary Report, IWTP 360, TtEMI, 2005*

2002/02-125 Navy-HPS/CTO-0018 IWTP Alameda/IWTP 360Graphics/fig01_regional location.ai

ITSI Innovative Technical Solutions, Inc.	**Amendment to Closure Summary Report** **Industrial Waste Treatment Plant 360** Alameda Point Alameda, California	**FIGURE 1** Alameda Point Location Map



CERCLA SITE BOUNDARY

BUILDING

LAND COVER

OPEN WATER

Note:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
IWTP = Industrial Waste Treatment Plant

N

600 0 600 1200 Feet

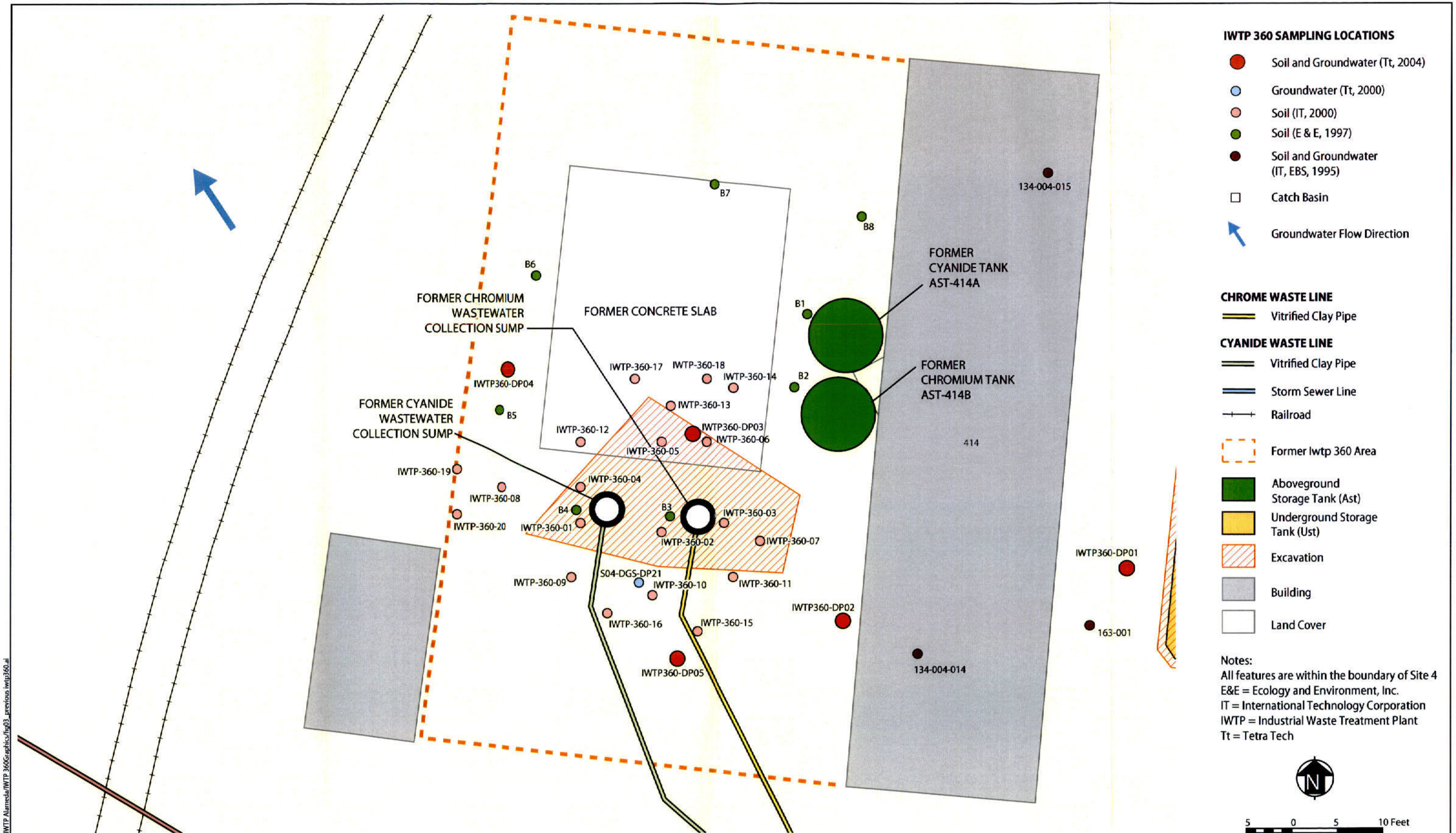
Source: *"Pre-Draft Amendment to Closure Summary Report, IWTP 360, TtEMI, 2005*

2002/02-125 Navy HPS/CTO 0018 IWTP Alameda/IWTP 360Graphics/fig02_iwtp360location.ai

Innovative Technical Solutions, Inc.

Amendment to Closure Summary Report
Industrial Waste Treatment Plant 360
Alameda Point
Alameda, California

FIGURE 2
Alameda Point and the Location of IWTP 360



Source: "Pre-Draft Amendment to Closure Summary Report, IWTP 360, TtEMI, 2005

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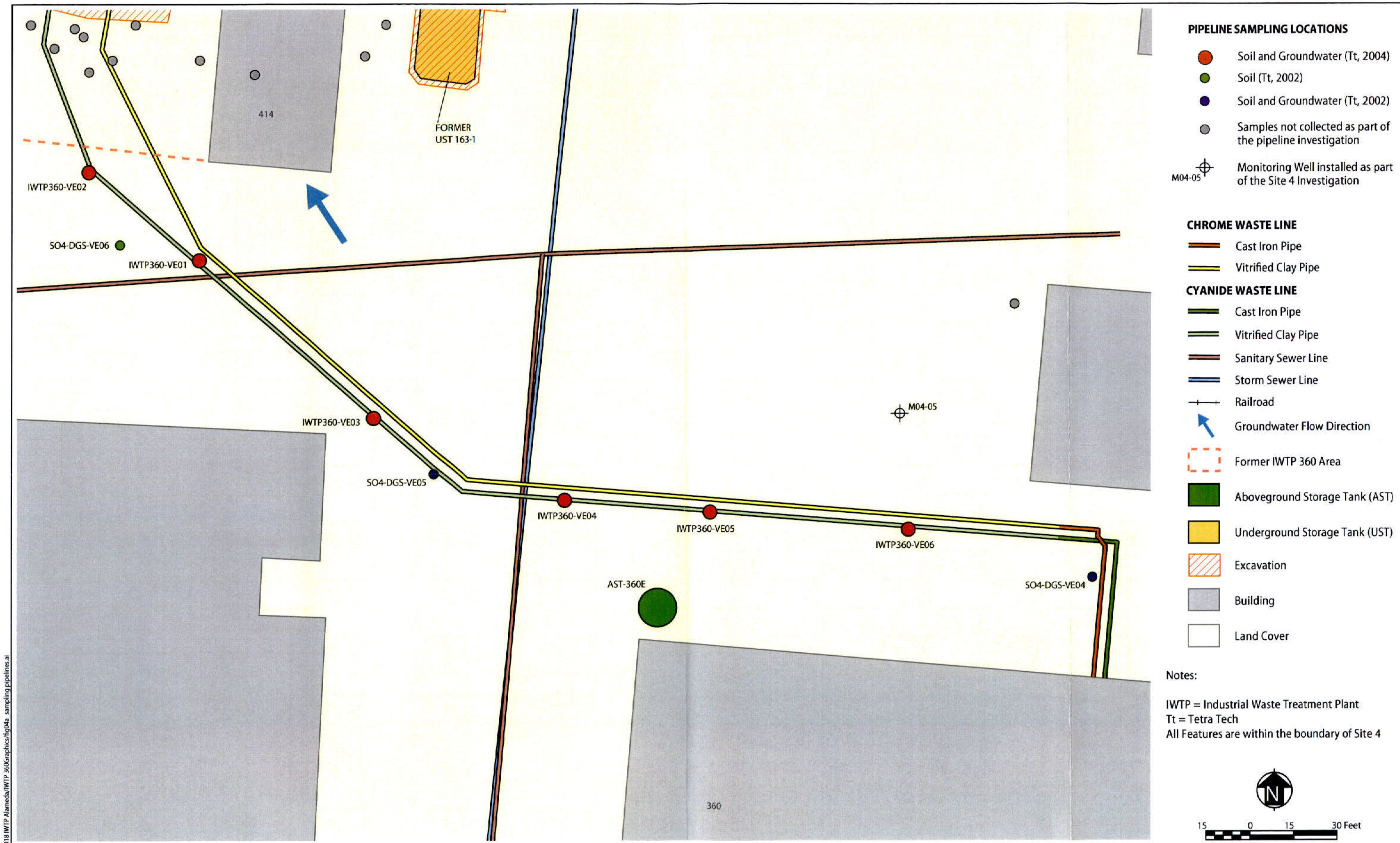
Amendment to Closure Summary Report
Industrial Waste Treatment Plant 360
Alameda Point
Alameda, California

FIGURE 3
Sampling Locations
in the Vicinity of IWTP 360



Source: *"Pre-Draft Amendment to Closure Summary Report, IWTP 360, TtEMI, 2005*

2002/02-125 Navy HPS/CTO-0018 IWTP Alameda/IWTP 360/Graphics/fig04a sampling pipelines.ai

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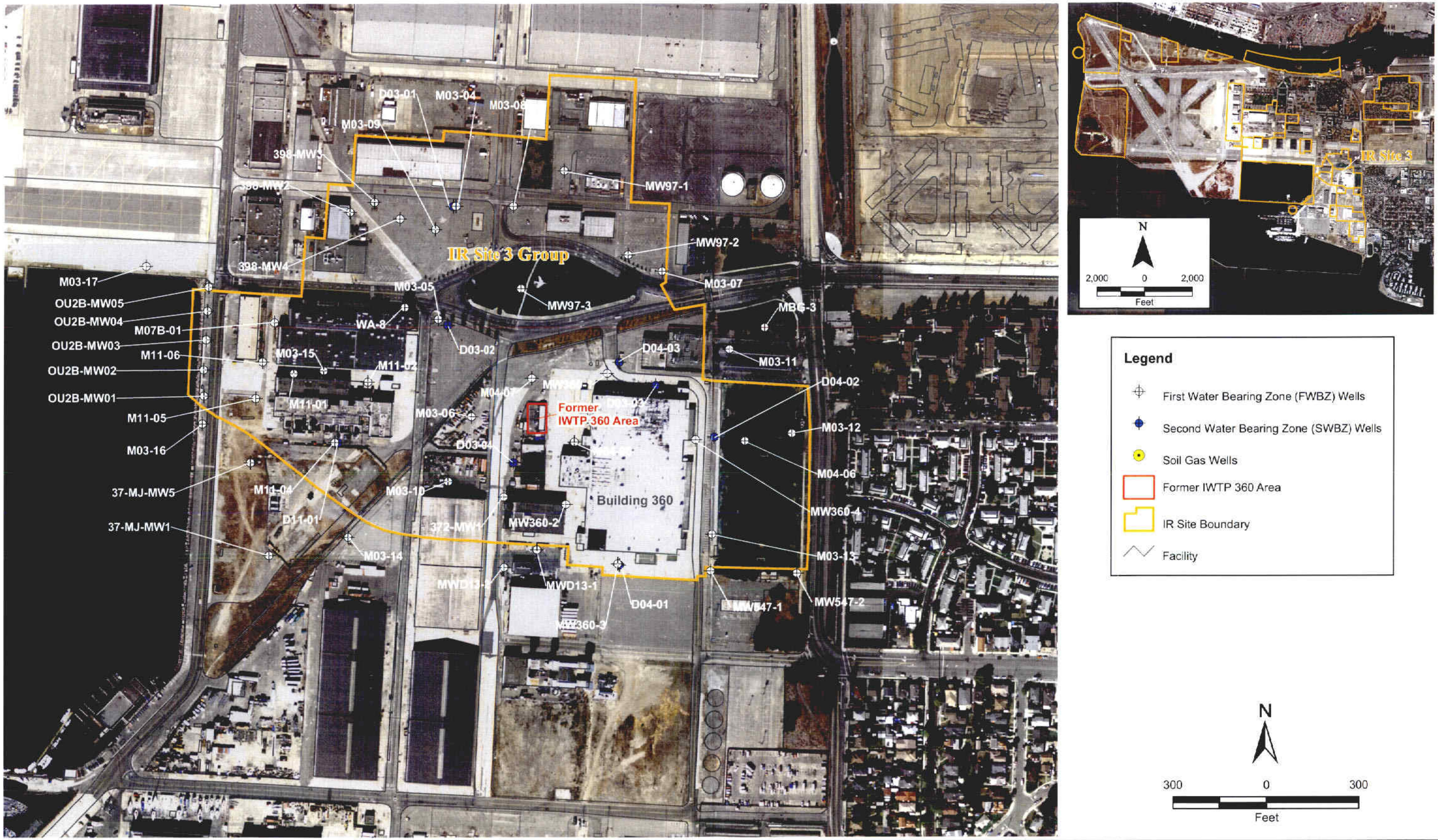
Amendment to Closure Summary Report
Industrial Waste Treatment Plant 360
Alameda Point
Alameda, California

FIGURE 4
Sampling Locations
Along Pipelines



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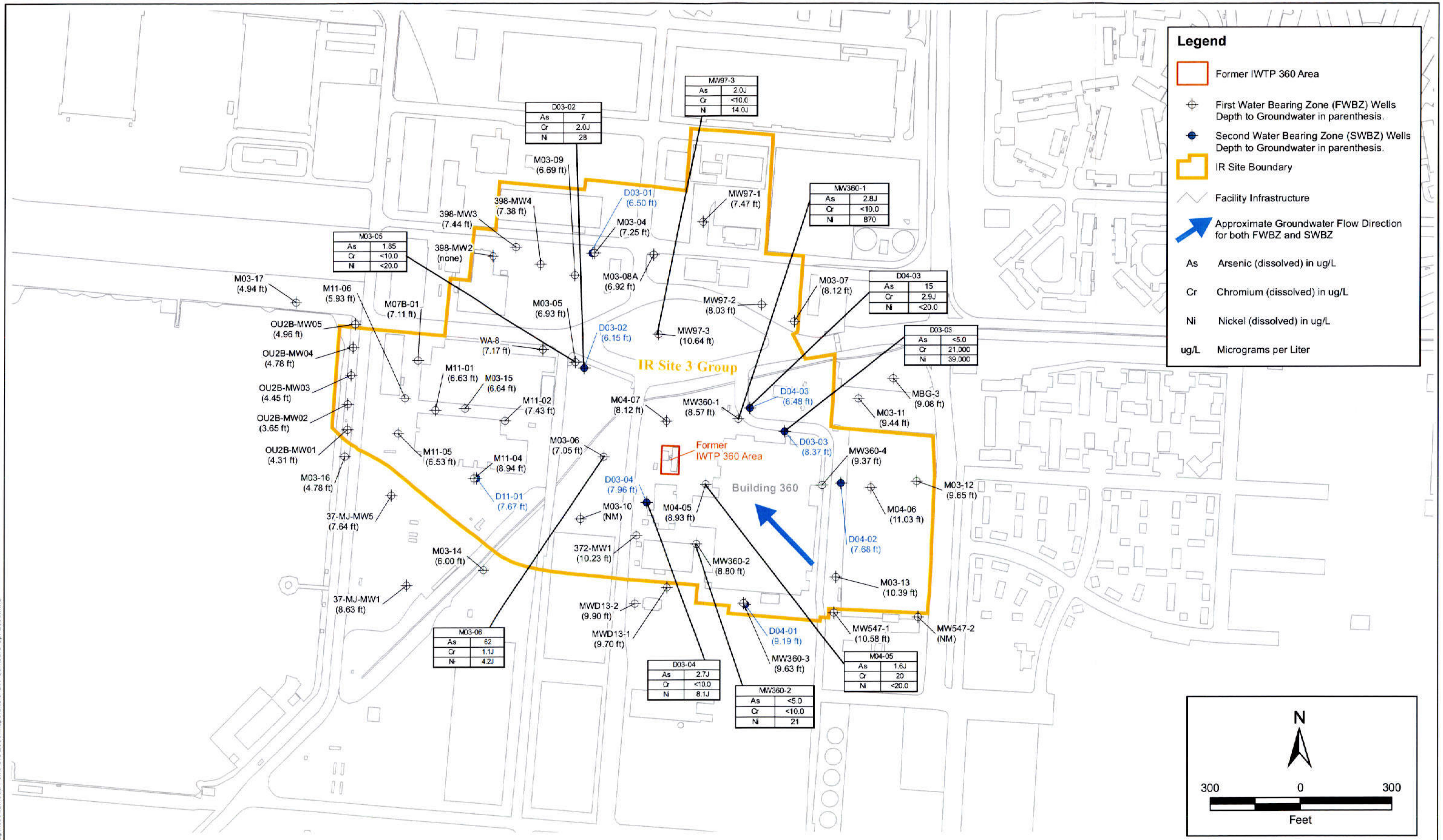
AMENDMENT TO CLOSURE SUMMARY REPORT
INDUSTRIAL WASTE TREATMENT PLANT 360
ALAMEDA POINT, ALAMEDA, CALIFORNIA

FIGURE 5
CERCLA IR SITE 3 GROUP
SITE AND WELL LOCATION MAP

2002 Projects\02 125.2000\GIS_PROJ\IR Site 3 IWTP 360\CERCLA Site Location Map.mxd



2002 Projects\02-125.11\Graphics\Alameda Point GIS\2006 Maps\Site 3 GW Contours Spr 2006.mxd

Innovative Technical Solutions, Inc.

AMENDMENT TO CLOSURE SUMMARY REPORT
INDUSTRIAL WASTE TREATMENT PLANT 360
ALAMEDA POINT, ALAMEDA, CALIFORNIA

FIGURE 6
CERCLA IR SITE 3 GROUP
SELECTED DISSOLVED METALS IN GROUNDWATER
OF SELECTED MONITORING WELLS
SPRING 2006

APPENDIX A

SOIL AND GROUNDWATER ANALYTICAL RESULTS AT IWTP 360, ALAMEDA POINT, ALAMEDA, CALIFORNIA

TABLE A-1: VALIDATED ANALYTICAL DATA FOR IWTP 360 - SOIL AND GROUNDWATER SAMPLES

Amendment to Closure Summary Report IWTP 360

Point Name	Sample ID	Sample Date	Sample Depth (feet bgs)	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Calcium (mg/kg)	Chromium (mg/kg)
Soil Results											
134-004-014	134-0014	4/4/1995	3 - 4.5	4,540.00 *J	1.40 UNJ	0.88 U	43.50 B	0.15 JU	0.07 JU	11,200.00 *J	34.60
134-004-014	134-0014M	4/4/1995	3.5 - 4		3.10 U	0.94	70.00	0.28	0.15		27.00
134-004-015	134-0015M	4/11/1995	2.5 - 3		3.30 U	1.30	26.00	0.26	0.13		28.00
IWTP-360-01	360-CS-007	8/24/2000	11.33 - 12						0.02 UJ		55.10
IWTP-360-01	360-CS-009	8/24/2000	13.33 - 14						0.23 UJ		124.00
IWTP-360-02	360-CS-014	8/24/2000	11.7 - 12						0.11 UJ		218.00
IWTP-360-02	360-CS-015	8/24/2000	13.7 - 14						1.90 UJ		243.00
IWTP-360-03	360-CS-020	8/24/2000	13.7 - 14						1.30 UJ		306.00
IWTP-360-04	360-CS-033	8/24/2000	10.7 - 11						5.90		390.00 J
IWTP-360-04	360-CS-034	8/24/2000	11.7 - 12						2.90		346.00 J
IWTP-360-04	360-CS-035	8/24/2000	13.7 - 14						1.10		422.00 J
IWTP-360-05	360-CS-039	8/24/2000	12 - 12.3						0.02 U		43.80 J
IWTP-360-05	360-CS-040	8/24/2000	14 - 14.3						0.21 U		108.00 J
IWTP-360-06	360-CS-044	8/24/2000	12 - 12.3						0.02 U		43.90
IWTP-360-06	360-CS-045	8/24/2000	14 - 14.3						0.02 U		94.80
IWTP-360-07	360-CS-024	8/24/2000	11.7 - 12						0.02 U		50.80 J
IWTP-360-07	360-CS-025	8/24/2000	13.7 - 14						0.02 U		51.50 J
IWTP-360-08	360-CS-026	8/24/2000	5.7 - 6						0.02 U		25.70 J
IWTP-360-08	360-CS-027	8/24/2000	7.7 - 8						0.02 U		28.50 J
IWTP-360-08	360-CS-028	8/24/2000	9.7 - 10						0.06 U		36.80 J
IWTP-360-08	360-CS-029	8/24/2000	11.7 - 12						0.02 U		44.90 J
IWTP-360-08	360-CS-030	8/24/2000	13.7 - 14						0.02 U		41.80 J
IWTP-360-09	360-CS-091	8/25/2000	6 - 6.3						1.00 U		58.40
IWTP-360-09	360-CS-092	8/25/2000	7.7 - 8						0.02 U		31.30
IWTP-360-09	360-CS-093	8/25/2000	10 - 10.3						0.02 U		48.70
IWTP-360-09	360-CS-094	8/25/2000	11.7 - 12						0.02 U		36.40
IWTP-360-09	360-CS-095	8/25/2000	14 - 14.3						0.02 U		56.90
IWTP-360-10	360-CS-086	8/25/2000	6 - 6.3						0.12 U		71.00
IWTP-360-10	360-CS-087	8/25/2000	7.7 - 8						0.02 U		27.70
IWTP-360-10	360-CS-088	8/25/2000	10 - 10.3						0.02 U		38.70
IWTP-360-10	360-CS-089	8/25/2000	11.7 - 12						0.18 U		52.10
IWTP-360-10	360-CS-090	8/25/2000	14 - 14.3						0.02 U		39.20
IWTP-360-11	360-CS-096	8/25/2000	6 - 6.3						2.00		68.60
IWTP-360-12	360-CS-071	8/25/2000	7 - 7.3						0.02 U		35.40 J
IWTP-360-12	360-CS-072	8/25/2000	8 - 8.3						0.02 U		30.70 J
IWTP-360-12	360-CS-073	8/25/2000	10 - 10.3						0.02 U		32.90 J
IWTP-360-12	360-CS-074	8/25/2000	12 - 12.3						0.02 U		46.40 J
IWTP-360-12	360-CS-075	8/25/2000	14 - 14.3						0.02 U		58.20 J
IWTP-360-13	360-CS-056	8/24/2000	6.3 - 6.6						0.02 U		132.00
IWTP-360-13	360-CS-057	8/24/2000	8 - 8.3						0.02 U		82.60
IWTP-360-13	360-CS-058	8/24/2000	10 - 10.3						0.02 U		77.10
IWTP-360-13	360-CS-059	8/24/2000	12 - 12.3						0.16 U		62.30
IWTP-360-13	360-CS-060	8/24/2000	14.3 - 14.6						0.02 U		42.20
IWTP-360-14	360-CS-046	8/24/2000	6.3 - 6.6						3.10		22.00
IWTP-360-14	360-CS-047	8/24/2000	8 - 8.3						0.02 U		29.20
IWTP-360-14	360-CS-048	8/24/2000	11 - 11.3						0.02 U		53.10
IWTP-360-14	360-CS-049	8/24/2000	12 - 12.3						0.21 U		46.80
IWTP-360-14	360-CS-050	8/24/2000	14 - 14.3						0.02 U		44.30
IWTP-360-15	360-CS-097	8/25/2000	6 - 6.3						0.02 U		25.90
IWTP-360-15	360-CS-098	8/25/2000	7.7 - 8						0.55 U		112.00
IWTP-360-15	360-CS-099	8/25/2000	10 - 10.3						0.02 U		24.70
IWTP-360-15	360-CS-100	8/25/2000	11.7 - 12						0.02 U		29.30
IWTP-360-15	360-CS-101	8/25/2000	14 - 14.3						0.02 UJ		56.00
IWTP-360-16	360-CS-102	8/25/2000	6 - 6.3						0.66 J		56.70
IWTP-360-16	360-CS-103	8/25/2000	7.7 - 8						0.02 UJ		25.60
IWTP-360-16	360-CS-104	8/25/2000	10 - 10.3						0.02 UJ		35.40
IWTP-360-16	360-CS-105	8/25/2000	11.7 - 12						0.21 UJ		44.20
IWTP-360-16	360-CS-106	8/25/2000	14 - 14.3						0.20 UJ		43.00
IWTP-360-17	360-CS-061	8/25/2000	6.3 - 6.6						0.53 U		18.90 J
IWTP-360-17	360-CS-062	8/25/2000	6.6 - 7						6.70		18.00 J
IWTP-360-17	360-CS-063	8/25/2000	8.3 - 8.5						0.02 U		27.00 J
IWTP-360-17	360-CS-064	8/25/2000	8.5 - 8.7						0.05 U		30.30 J
IWTP-360-17	360-CS-065	8/25/2000	10 - 10.3						0.02 U		40.80 J
IWTP-360-17	360-CS-066	8/25/2000	10.3 - 10.6						0.02 U		47.10 J
IWTP-360-17	360-CS-067	8/25/2000	12 - 12.3						0.02 U		46.50 J
IWTP-360-17	360-CS-068	8/25/2000	12.3 - 12.6						0.02 U		45.70 J
IWTP-360-17	360-CS-069	8/25/2000	14 - 14.3						0.02 U		48.00 J
IWTP-360-17	360-CS-070	8/25/2000	14.3 - 14.6						0.02 U		47.20 J
IWTP-360-18	360-CS-051	8/24/2000	6.5 - 6.8						0.34 U		19.40
IWTP-360-18	360-CS-052	8/24/2000	8 - 8.3						0.02 U		25.20
IWTP-360-18	360-CS-053	8/24/2000	10 - 10.3						0.48 U		7.50
IWTP-360-18	360-CS-054	8/24/2000	12 - 12.3						0.02 U		42.00
IWTP-360-18	360-CS-055	8/24/2000	14 - 14.3						0.02 U		43.80
IWTP-360-19	360-CS-076	8/25/2000	6 - 6.3						0.03 U		11.60 J
IWTP-360-19	360-CS-077	8/25/2000	7.7 - 8						0.02 U		30.00 J
IWTP-360-19	360-CS-078	8/25/2000	10 - 10.3						0.02 U		31.50 J
IWTP-360-19	360-CS-079	8/25/2000	11.7 - 12						0.02 U		39.60 J
IWTP-360-19	360-CS-080	8/25/2000	14 - 14.3						0.02 U		36.00 J
IWTP-360-20	360-CS-081	8/25/2000	6 - 6.3						0.03 U		10.20
IWTP-360-20	360-CS-082	8/25/2000	7.7 - 8						0.02 U		26.60
IWTP-360-20	360-CS-083	8/25/2000	10 - 10.3						0.02 U		27.80
IWTP-360-20	360-CS-084	8/25/2000	11.7 - 12						0.02 U		56.60
IWTP-360-20	360-CS-085	8/25/2000	14 - 14.3						0.02 U		86.10
IWTP360-DP01	033-IWTP360-001	3/3/2004	1.5 - 2	5,190.00	0.49 U	1.70 U	48.40	0.03 U	0.05 U	3,000.00	42.70
IWTP360-DP01	033-IWTP360-002	3/3/2004	4.5 - 5	5,340.00	0.49 U	15.50	92.40	0.03 U	0.24 U	10,000.00	35.80
IWTP360-DP02	033-IWTP360-003	3/3/2004	1.5 - 2	4,420.00	0.48 U	1.40 U	38.40	0.03 U	0.05 U	5,130.00	34.90
IWTP360-DP02	033-IWTP360-004	3/3/2004	4.5 - 5	4,310.00	0.50 U	1.20 U	52.10	0.03 U	0.09 U	3,020.00	36.90
IWTP360-DP05	033-IWTP360-034	3/5/2004	1.5 - 2	4,860.00	0.78 U	2.00 U	53.80	0.03 U	0.22 U	5,390.00	32.80
IWTP360-DP05	033-IWTP360-035	3/5/2004	4 - 4.5	4,070.00	0.49 U	1.50 U	58.90	0.03 U	0.13 U	11,000.00	49.80
IWTP360-VE01	033-IWTP360-012	3/4/2004	3 - 3.5	4,930.00	0.47 U	1.90 U	52.80	0.03 U	18.90	4,830.00	44.90
IWTP360-VE01	033-IWTP360-013	3/4/2004	4 - 4.5	4,930.00	0.49 U	1.40 U	42.70	0.03 U	17.00	15,300.00	129.00
IWTP360-VE02	033-IWTP360-015	3/4/2004	3 - 3.5	4,190.00	0.47 U	3.40	64.50	0.03 U	0.30 U	3,570.00	30.40
IWTP360-VE03	033-IWTP360-018	3/4/2004	2.5 - 3	5,430.00	0.48 U	3.80	59.60	0.03 U	0.10 U	5,460.00	32.40
IWTP360-VE03	033-IWTP360-019	3/5/2004	4.16 - 4.66	3,550.00	0.49 U	1.00 U	51.00	0.03 U	0.09 U	4,860.00	26.80
IWTP360-VE04	033-IWTP360-021	3/4/2004	3 - 3.5	5,090.00	0.47 U	2.30 U	58.70	0.03 U	0.41 U	18,200.00	35.10

Point Name	Sample ID	Hexavalent Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Magnesium (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Potassium (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Sodium (mg/kg)	Thallium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
134-004-014	134-0014		3.30 B	6.60 J	6,800.00 J	1.80	2,020.00	97.70 NJ	0.17 U	2.20 U	18.60	488.00 B	0.57 U	0.20 U	190.00 U	3.60 U	18.80	17.20
134-004-014	134-0014M		4.00	14.00		1.40			0.11 U	1.00 U	19.00		0.26 U	0.52 U		0.26 U	20.00	19.00
134-004-015	134-0015M		4.00	11.00		1.50			0.11 U	1.10 U	20.00		0.27 U	0.54 U		0.27 U	18.00	17.00
IWTP360-DP01	033-IWTP360-001	0.05 U	5.70	8.30 U	10,300.00	5.00	2,550.00	117.00	0.04 U	0.13 U	27.60	396.00	0.58 U	0.13 U	34.00 U	0.43 U	21.90	21.60
IWTP360-DP01	033-IWTP360-002	0.06 U	10.20	56.60 J	28,800.00	215.00	3,190.00	288.00	0.11 J	0.81 U	47.30	452.00	0.58 U	0.13 U	34.00 U	0.43 U	32.10	101.00
IWTP360-DP02	033-IWTP360-003	0.05 U	5.10	5.30 U	8,350.00	2.60	2,380.00	103.00	0.03 U	0.12 U	24.80	368.00	0.56 U	0.12 U	33.00 U	0.41 U	20.40	16.30
IWTP360-DP02	033-IWTP360-004	0.05 U	5.10	6.90 U	9,110.00	4.80	2,660.00	154.00	0.02 U	0.13 U	27.40	427.00	0.59 U	0.13 U	35.00 U	0.43 U	19.60	21.70
IWTP360-DP05	033-IWTP360-034	0.05 U	5.50	11.80 J	9,380.00	9.70	2,580.00	120.00	0.05 J	0.12 U	28.20	421.00	0.55 U	0.12 U	32.00 U	0.40 U	21.50	26.40
IWTP360-DP05	033-IWTP360-035	0.05 U	5.10	8.20 U	8,340.00	7.80	2,630.00	120.00	0.07 J	0.12 U	27.80	427.00	0.58 U	0.12 U	34.00 U	0.42 U	19.40	22.40
IWTP360-VE01	033-IWTP360-012	0.09	5.90	11.40 J	8,940.00	25.80	2,490.00	138.00	0.06 J	0.12 U	130.00	367.00	0.56 U	0.12 U	32.00 U	0.41 U	20.50	38.50
IWTP360-VE01	033-IWTP360-013	0.35	5.50	12.60 J	9,260.00	18.80	2,620.00	121.00	0.06 J	0.14 U	184.00	381.00	0.58 U	1.10 U	34.00 U	0.43 U	21.80	30.70
IWTP360-VE02	033-IWTP360-015	0.05 U	5.50	22.00 J	13,300.00	8.60	2,500.00	137.00	0.00 U	0.38 U	28.00	440.00	0.55 U	0.12 U	32.00 U	0.40 U	19.60	27.10
IWTP360-VE03	033-IWTP360-018	0.05 U	5.70	9.70 J	11,200.00	8.10	2,800.00	149.00	0.04 U	0.12 U	26.00	436.00	0.56 U	0.12 U	33.00 U	0.41 U	21.90	27.30
IWTP360-VE03	033-IWTP360-019	0.21	4.80	8.20 U	6,980.00	4.70	2,070.00	128.00	0.04 U	0.63 U	25.40	276.00	0.58 U	0.58 U	34.00 U	0.42 U	14.90	17.10
IWTP360-VE04	033-IWTP360-021	0.06	5.20	10.60 J	9,280.00	17.10	2,720.00	127.00	0.06 J	0.12 U	24.10	468.00	0.56 U	0.12 U	32.00 U	0.41 U	22.50	25.70

TABLE A-1: VALIDATED ANALYTICAL DATA FOR IWTP 360 - SOIL AND GROUNDWATER SAMPLES

Point Name	Sample ID	Sample Date	Sample Depth (feet bgs)	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Calcium (mg/kg)
Soil Results										
IWTP360-VE04	033-IWTP360-022	3/4/2004	4 - 4.5	5,620.00	0.49 U	4.00	74.10	0.03 U	1.10 U	26,300.00
IWTP360-VE05	033-IWTP360-024	3/5/2004	2.5 - 3	3,390.00	0.12 U	0.35 U	35.50	0.01 U	9.20	3,190.00
IWTP360-VE05	033-IWTP360-025	3/5/2004	4.5 - 5	5,470.00	0.82 U	7.70	279.00	0.03 U	4.50	29,900.00
IWTP360-VE06	033-IWTP360-027	3/5/2004	2.5 - 3	4,010.00	0.48 U	4.50	154.00	0.03 U	0.26 U	7,710.00
IWTP360-VE06	033-IWTP360-028	3/5/2004	4.5 - 5	5,240.00	0.52 U	4.90	192.00	0.03 U	0.30 U	5,940.00
S04-DGS-VE04	385-S04-305	4/26/2002	3 - 3.5							
S04-DGS-VE04	385-S04-305A	4/26/2002	3 - 3.5						0.34 J	
S04-DGS-VE04	385-S04-306	4/26/2002	5 - 5.5							
S04-DGS-VE04	385-S04-306A	4/26/2002	5 - 5.5						1.50 J	
S04-DGS-VE05	385-S04-308	4/26/2002	3 - 3.5							
S04-DGS-VE05	385-S04-308A	4/26/2002	3 - 3.5						7.80 J	
S04-DGS-VE05	385-S04-309	4/26/2002	5 - 5.5							
S04-DGS-VE05	385-S04-309A	4/26/2002	5 - 5.5						0.48 J	
S04-DGS-VE06	385-S04-311	4/26/2002	3 - 3.5							
S04-DGS-VE06	385-S04-311A	4/26/2002	3 - 3.5						31.60 J	

Sample ID	Chromium (mg/kg)	Hexavalent Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Magnesium (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)
033-IWTP360-022	83.00	0.93	5.60	34.60 J	14,900.00	54.00	3,820.00	192.00	0.11
033-IWTP360-024	205.00	0.13	4.40	12.40 J	6,860.00	17.50	1,880.00	89.70	0.13 J
033-IWTP360-025	136.00	0.05 U	6.50	94.70 J	16,600.00	264.00	4,930.00	189.00	0.13
033-IWTP360-027	111.00	0.07	5.00	23.60 J	9,090.00	71.70	2,750.00	155.00	0.05 J
033-IWTP360-028	38.20	0.05 U	5.60	24.40 J	10,600.00	56.90	2,650.00	192.00	0.04 U
385-S04-305	32.00	0.06 U							
385-S04-305A				13.10		5.40			
385-S04-306	33.60	0.06 U							
385-S04-306A				38.00		7.50			
385-S04-308	98.60	0.13							
385-S04-308A				62.60		90.10			
385-S04-309	53.50	0.06 U							
385-S04-309A				16.40		72.10			
385-S04-311	38.10	1.20							
385-S04-311A				8.30		2.40			

Sample ID	Molybdenum (mg/kg)	Nickel (mg/kg)	Potassium (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Sodium (mg/kg)	Thallium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
033-IWTP360-022	3.10	34.50	476.00	0.58 U	4.20	33.00 U	0.42 U	24.00	73.30
033-IWTP360-024	0.20 U	155.00	317.00	0.15 U	1.10	8.40 U	0.11 U	17.20	21.40
033-IWTP360-025	0.49 U	148.00	608.00	0.60 U	1.50	177.00 U	0.44 U	25.20	97.30
033-IWTP360-027	0.64 U	26.00	463.00	0.56 U	0.89 U	33.00 U	0.41 U	17.20	54.90
033-IWTP360-028	5.10	24.90	590.00	0.61 U	0.13 U	35.00 U	0.44 U	20.40	50.90
385-S04-305									
385-S04-305A		33.00			1.40 J				
385-S04-306									
385-S04-306A		47.00			2.70				
385-S04-308									
385-S04-308A		110.00			10.00				
385-S04-309									
385-S04-309A		36.00			1.60 J				
385-S04-311									
385-S04-311A		165.00			3.30				

Notes:
*J Duplicate analyses is not within control limits; concentration is estimated
[1] Excludes invalidated and ex situ data
B Reported value is less than the contract required detection limit, but greater than the instrument detection limit.
bgs Below ground surface
J Estimated concentration
JU Not detected as an estimated concentration
mg/kg Milligrams per kilogram
N Spiked sample recovery is not within control limits
NJ Spiked sample recovery is not within control limits; concentration is estimated
U Not detected
UJ Not detected as an estimated concentration
UNJ Not detected; spiked sample recovery is not within control limits; concentration is estimated

TABLE A-1: VALIDATED ANALYTICAL DATA FOR IWTP 360 - SOIL AND GROUNDWATER SAMPLES

Amendment to Closure Summary Report IWTP 360

Point Name	Sample ID	Sample Date	Sample Depth (feet bgs)	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Calcium (µg/L)	Chromium (µg/L)	Hexavalent Chromium (µg/L)	Cobalt (µg/L)
Groundwater Results													
IWTP360-DP02	033-IWTP360-005	3/4/2004	5 - 6	36.10 U	5.00 U	2.30 U	74.20	0.13 U	0.38 U	90,800.00	4.10 J	10.00 U	0.27 U
IWTP360-DP02	033-IWTP360-006	3/4/2004	10 - 12	23.70 U	3.50 U	31.90	128.00	0.13 U	0.41 U	82,900.00	2.30 J	10.00 U	0.64 U
IWTP360-DP03	033-IWTP360-007	3/3/2004	5 - 6	3,150.00	6.60 U	2.30 U	58.70	0.13 U	0.63 U	66,700.00	35.60	10.00 U	2.80 U
IWTP360-DP03	033-IWTP360-008	3/3/2004	8 - 10	24.90 U	3.00 U	20.40	124.00	0.13 U	1.40 U	56,800.00	3.50 J	10.00 U	1.60 U
IWTP360-DP04	033-IWTP360-009	3/3/2004	5 - 6	23.20 U	6.80 U	41.10	194.00	0.13 U	0.42 U	93,300.00	2.50 J	10.00 U	2.50 U
IWTP360-DP05	033-IWTP360-036	3/5/2004	8 - 10	490.00	7.40 U	3.80 U	80.00	0.13 U	0.33 U	76,800.00	274.00	20.00	4.40 U
IWTP360-VE03	033-IWTP360-020	3/5/2004	7 - 9	153.00	3.80 U	2.30 U	10.40 U	0.24 U	0.28 U	40,300.00	47.60	20.00	0.30 U
IWTP360-VE04	033-IWTP360-023	3/5/2004	8 - 10	147.00	8.80 U	6.60 U	23.70 U	0.13 U	0.44 U	11,600.00	5.10	10.00 U	0.32 U
IWTP360-VE06	033-IWTP360-029	3/5/2004	8 - 10	313.00	3.70 U	19.90	112.00	0.13 U	0.48 U	83,900.00	4.50 J	10.00 U	0.89 U
S04-DGS-DP21	385-S04-075	7/9/2001	7 - 7						0.25 U		1.30 UJ	10.00 U	
S04-DGS-DP21	385-S04-076	7/10/2001	12 - 12						0.27 J		26.60		
S04-DGS-DP21	385-S04-076A	7/10/2001	12 - 12									10.00 UJ	
S04-DGS-VE04	385-S04-307	4/26/2002	7 - 7								1.00 UJ	10.00 UJ	
S04-DGS-VE04	385-S04-307A	4/26/2002	7 - 7						0.40 UJ				
S04-DGS-VE05	385-S04-310	4/26/2002	7 - 7								1.20 UJ	10.00 UJ	
S04-DGS-VE05	385-S04-310A	4/26/2002	7 - 7						0.37 UJ				

Point Name	Sample ID	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Magnesium (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Potassium (µg/L)
Groundwater Results										
IWTP360-DP02	033-IWTP360-005	14.00 U	83.70	1.20 U	18,300.00	82.60	0.05 U	10.90 U	4.30 U	9,530.00 J
IWTP360-DP02	033-IWTP360-006	4.90 U	1,680.00	1.40 U	22,000.00	2,070.00	0.06 U	12.30 U	4.10 U	9,960.00 J
IWTP360-DP03	033-IWTP360-007	18.30 U	3,980.00	3.50 U	17,800.00	83.60	0.04 U	22.30	15.90	1,890.00 J
IWTP360-DP03	033-IWTP360-008	16.20 U	54.10 U	5.90 U	12,400.00	338.00	0.05 U	42.00	13.80	5,210.00 J
IWTP360-DP04	033-IWTP360-009	8.80 U	2,620.00	1.70 U	29,100.00	504.00	0.05 U	21.50	17.80	11,200.00 J
IWTP360-DP05	033-IWTP360-036	12.50 U	626.00	7.30 U	17,800.00	52.30	0.09 U	49.50	78.30	10,000.00 J
IWTP360-VE03	033-IWTP360-020	16.30 U	56.50 U	2.30 U	2,480.00	2.00 U	0.09 U	21.80	2.60 U	4,210.00 J
IWTP360-VE04	033-IWTP360-023	22.50 U	121.00	1.20 U	4,320.00	403.00	0.06 U	272.00	26.50	881.00 J
IWTP360-VE06	033-IWTP360-029	14.40 U	1,200.00	3.60 U	31,900.00	1,860.00	0.06 U	34.90	7.30 U	19,200.00 J
S04-DGS-DP21	385-S04-075									
S04-DGS-DP21	385-S04-076									
S04-DGS-DP21	385-S04-076A									
S04-DGS-VE04	385-S04-307									
S04-DGS-VE04	385-S04-307A	3.50 UJ		0.71 J					3.60 J	
S04-DGS-VE05	385-S04-310									
S04-DGS-VE05	385-S04-310A	5.30 UJ		2.60 J					6.70 J	

Point Name	Sample ID	Selenium (µg/L)	Silver (µg/L)	Sodium (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)
Groundwater Results							
IWTP360-DP02	033-IWTP360-005	2.60 U	0.56 U	30,300.00	1.90 U	5.60 U	9.90 U
IWTP360-DP02	033-IWTP360-006	2.60 U	1.20 U	89,100.00	1.90 U	0.74 J	9.40 U
IWTP360-DP03	033-IWTP360-007	3.20 U	0.56 U	63,000.00	1.90 U	11.50 U	26.10
IWTP360-DP03	033-IWTP360-008	2.60 U	1.00 U	89,800.00	1.90 U	5.10 U	10.90 U
IWTP360-DP04	033-IWTP360-009	2.60 U	0.56 U	94,200.00	1.90 U	2.10 U	31.00
IWTP360-DP05	033-IWTP360-036	10.90 U	0.56 U	86,300.00	1.90 U	77.20	15.50
IWTP360-VE03	033-IWTP360-020	2.60 U	1.20 U	25,900.00	1.90 U	7.50 U	13.10 U
IWTP360-VE04	033-IWTP360-023	2.60 U	0.56 U	280,000.00	1.90 U	18.00	28.20
IWTP360-VE06	033-IWTP360-029	2.60 U	0.66 U	56,900.00	1.90 U	4.50 U	12.30 U
S04-DGS-DP21	385-S04-075						
S04-DGS-DP21	385-S04-076						
S04-DGS-DP21	385-S04-076A						
S04-DGS-VE04	385-S04-307						
S04-DGS-VE04	385-S04-307A		0.25 U				
S04-DGS-VE05	385-S04-310						
S04-DGS-VE05	385-S04-310A		0.25 U				

Notes:

bgs Below ground surface

J Estimated concentration

U Not detected

UJ Not detected at the estimated concentration

TABLE A-2: UNVALIDATED ANALYTICAL DATA FOR IWTP 360

						All values shown in mg/kg																			
Location	Sample ID	Date	Matrix	Depth (feet bgs)	Removed	Antimony	Arsenic	Barium	Beryllium	Cadmium	Cobalt	Total Chromium	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
B2	B2-1	7/1/97	Soil	1	No	6.3 U	3.9	71	0.53 U	0.53 U	5.1	29	7.8	7900	7	0.021 U	1 U	30	0.53 U	1 U	0.53	18	30
B2	B2-2	7/1/97	Soil	2	No	6.9 U	3	40	0.57 U	0.57 U	64	31	7.8	9400	6.4	0.023 U	1.1 U	30	0.57 U	1.1 U	0.57 U	23	23
B2	B2-4	7/1/97	Soil	4	No	6.7 U	2.2	33	0.56 U	0.56 U	5.1	32	5.3	8000	2.3	0.022 U	1.1 U	25	0.56 U	1.1 U	0.56 U	22	17
B3	B3-6	7/1/97	Soil	6	Yes	6.7 U	2.6	50	0.56 U	4.4	4.6	32	13	7000	7.9	0.022 U	1.1 U	69	0.56 U	1.1 U	0.56 U	18	20
B3	B3-10	7/1/97	Soil	10	Yes	7 U	2.3	66	0.6 U	0.6 U	3.8	260	11	6000	15	0.024 U	1.2 U	22	0.6 U	1.2 U	0.6 U	14	23
B4	B4-1	7/1/97	Soil	1	Yes	6.2 U	3.7	92	0.65	0.52 U	6.5	12	11	12000	8.2	0.021 U	1 U	15	0.52 U	1 U	1.3	23	33
B4	B4-6	7/1/97	Soil	6	Yes	6.6 U	3	210	0.55 U	10	4.4	27	34	8100	17	0.077	1.1 U	34	0.55 U	2.1	0.55 U	23	25
B4	B4-8	7/1/97	Soil	8	Yes	7 U	4.8	97	0.59 U	0.59 U	5.5	27	24	8500	26	0.12	9.2	24	0.59 U	1.2 U	0.59 U	24	33
B4	B4-10	7/1/97	Soil	10	Yes	7.1 U	6	73	0.6 U	0.6 U	7.6	44	16	14000	6.7	0.024 U	15	44	0.6 U	1.2 U	0.6 U	32	30
B5	B5-1	7/1/97	Soil	1	No	6.4 U	2.6	47	0.53 U	0.53 U	6.4	35	7.1	9500	4	0.021 U	1.1 U	31	0.53 U	1.1 U	0.53 U	24	23
B5	B5-2	7/1/97	Soil	2	No	6.4 U	2.4	36	0.54 U	0.54 U	5	28	5	7500	2	0.022 U	1.1 U	25	0.54 U	1.1 U	0.54 U	19	16
B5	B5-4	7/1/97	Soil	4	No	6.7 U	2.2	28	0.56 U	0.56 U	4.3	26	5	6800	2.1	0.022 U	1.1 U	23	0.56 U	1.1 U	0.56 U	16	18
B6	B6-1	7/1/97	Soil	1	No	6.3 U	2.2	22	0.53 U	0.53 U	4.9	30	5.5	7200	1.6	0.021 U	1 U	23	0.53 U	1 U	0.53 U	20	17
B6	B6-2	7/1/97	Soil	2	No	6.3 U	1.8	24	0.53 U	0.53 U	4.5	29	4.8	6500	2.1	0.021 U	1 U	23	0.53 U	1 U	0.53 U	19	18
B6	B6-4	7/1/97	Soil	4	No	6.6 U	2.5	40	0.55 U	0.55 U	4.7	28	5	7500	2.4	0.022 U	1.1 U	24	0.55 U	1.1 U	0.55 U	19	16
B7	B7-1	7/1/97	Soil	1	No	6.4 U	2.2	53	0.53 U	0.53 U	5.8	31	7.3	7800	2.3	0.021 U	1.1 U	26	0.53 U	1.1 U	0.53 U	22	21
B7	B7-2	7/1/97	Soil	2	No	6.7 U	1.8	44	0.56 U	0.56 U	4.2	26	5.6	6100	2.5	0.022 U	1.1 U	25	0.56 U	1.1 U	0.56 U	14	15
B7	B7-4	7/1/97	Soil	4	No	6.3 U	1.9	25	0.53 U	0.53 U	4.1	24	4.7	6000	2.1	0.021 U	1 U	20	0.53 U	1 U	0.53 U	16	16
B8	B8-1	7/1/97	Soil	1	No	6.4 U	1.8	41	0.53 U	0.53 U	3.8	14	8.5	7300	3.3	0.021 U	1.1 U	24	0.53 U	1.1 U	0.53 U	14	19
B8	B8-6	7/1/97	Soil	6	No	6.7 U	5.5	77	0.56 U	0.56 U	4.4	27	5.8	8500	5.1	0.022 U	1.1 U	16	0.56 U	1.1 U	0.56 U	22	17
B8	B8-10	7/1/97	Soil	10	No	7.2 U	3.4	50	0.6 U	0.6 U	7.8	34	9.7	12000	3.9	0.024 U	1.2 U	40	0.6 U	1.2 U	0.76	25	26

Notes:

Collected by Ecology and Environment, Inc. in 1997; data were not validated.

bgs Below ground surface

mg/kg *Milligrams per kilogram*

U Not detected

TABLE A-3: ANALYTICAL DATA FOR EX SITU SOIL

Amendment to Closure Summary Report IWTP 360

Point Name	Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Chromium (mg/kg)
IWTP-360-01	360-CS-001	8/24/2000	6 - 6	0.02 UJ	41.7
IWTP-360-01	360-CS-002	8/24/2000	6 - 6	0.02 UJ	39
IWTP-360-01	360-CS-003	8/24/2000	9 - 9	0.83 UJ	174
IWTP-360-01	360-CS-004	8/24/2000	9 - 9	1.7 UJ	502
IWTP-360-01	360-CS-005	8/24/2000	10 - 11	0.02 UJ	50
IWTP-360-01	360-CS-006	8/24/2000	10 - 11	0.17 UJ	43.7
IWTP-360-02	360-CS-011	8/24/2000	6 - 7	3.8 UJ	209
IWTP-360-02	360-CS-012	8/24/2000	8 - 8	3.3 UJ	38.6
IWTP-360-02	360-CS-013	8/24/2000	10 - 10	0.22 UJ	39.5
IWTP-360-03	360-CS-016	8/24/2000	6 - 6	13.8 UJ	351
IWTP-360-03	360-CS-017	8/24/2000	8 - 8	0.02 UJ	32.2
IWTP-360-03	360-CS-018	8/24/2000	10 - 10	8.2 UJ	250
IWTP-360-03	360-CS-019	8/24/2000	12 - 12	0.27 UJ	491
IWTP-360-07	360-CS-021	8/24/2000	6 - 6	0.27 U	34.4 J
IWTP-360-07	360-CS-022	8/24/2000	8 - 8	0.17 U	372 J
IWTP-360-07	360-CS-023	8/24/2000	10 - 10	0.02 U	27.1 J
IWTP-360-04	360-CS-031	8/24/2000	7 - 7	0.56	27.1 J
IWTP-360-04	360-CS-032	8/24/2000	8 - 8	38.4	40 J
IWTP-360-05	360-CS-036	8/24/2000	6 - 6	0.02 U	245 J
IWTP-360-05	360-CS-037	8/24/2000	8 - 8	0.02 U	249 J
IWTP-360-05	360-CS-038	8/24/2000	10 - 10	0.05 U	122 J
IWTP-360-06	360-CS-041	8/24/2000	6 - 7	8.7	32.1
IWTP-360-06	360-CS-042	8/24/2000	8 - 8	3.1	46.1
IWTP-360-06	360-CS-043	8/24/2000	10 - 10	0.02 U	230

Notes:

bgs	Below ground surface
J	Estimated concentration
mg/kg	Milligrams per kilogram
U	Not detected
UJ	Not detected at the estimated concentration

Appendix B: Technical Memorandum
Background Evaluation and Identification of COPCs

B1.0 INTRODUCTION

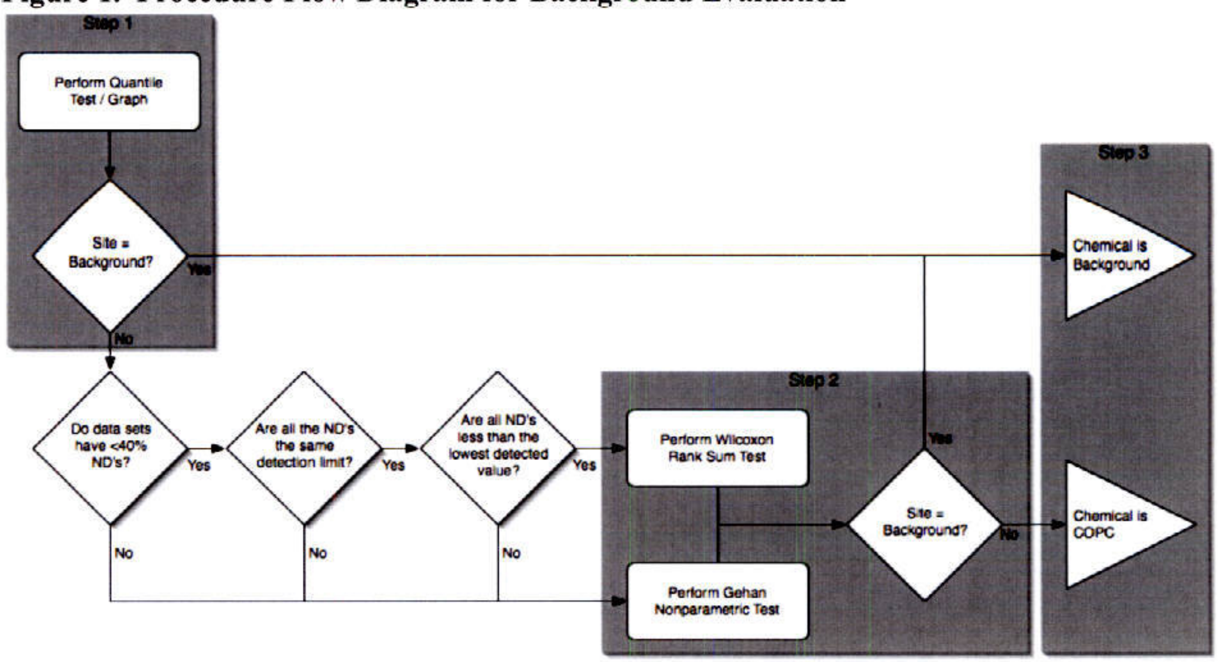
The following Technical Memorandum presents the results of the background evaluation for available data from the Industrial Wastewater Treatment Plant (IWTP) 360, Alameda Point, Alameda, CA. This document replaces the background evaluation prepared by Tetra Tech EM Inc. (TtEMI) for Naval Facilities Engineering Command, Southwest (NFEC SW) included in the previously submitted *Draft Amendment to Closure Summary Report.*

Previous characterization efforts have identified metals as having potentially impacted the soil and groundwater from historic operations of the waste treatment facility. This document presents the results of a background evaluation of the available site metals data for both soil and groundwater as presented in the *Draft Final Amendment to Closure Summary Report.* This evaluation used information on background metals values for soil and groundwater published in *Summary of Background Concentrations in Soil and Groundwater, Alameda Point* by TtEMI, dated December 2001 (provided as Attachment 1) as recalculated by TtEMI in Tables 3.1 and 3.2 (also in Attachment 1) as part of their Draft Human Health Risk Assessment (HHRA) provided in the *Draft Amendment to Closure Summary Report.* To facilitate the evaluation, raw laboratory results were obtained from TtEMI for the samples used in the above-referenced background study.

B2.0 PROCEDURE FOR BACKGROUND EVALUATION

The background evaluation was performed according to the procedural flow diagram shown in Figure 1, previously provided to DTSC in September 12, 2006 *Response to Comments IWTP 360*. This procedural flow diagram was developed to evaluate whether the metals detected in soil and groundwater samples from IWTP 360 were potentially from historic site operations, or are the metals detected consistent with background values and thus unrelated to historic site operations.

Figure 1. Procedure Flow Diagram for Background Evaluation



The available site data was evaluated against the available background data using the above procedure to determine if a metal is "consistent with" or "not consistent with" background. A metal with site concentrations resulting in "no statistically significant" difference between the site data and background data would be considered "consistent with" background and therefore not be identified as a Chemical of Potential Concern (COPC). Alternatively, a metal with site concentrations resulting in either an inconclusive result or a "statistically significant" difference between the site data and background data would be considered "not consistent with" the background population and would therefore be identified as a COPC.

The site data consists of the analytical results for soil and groundwater samples collected from soil borings drilled within IWTP 360 (by direct-push and vacuum excavation methods), as provided in Tables A-1 through A-3 of the *Draft Final Amendment to Closure Summary Report.* The background soils data consist of the "blue" background data set identified in the 2001 background study. The "blue" background soil area is one of three background areas developed as part of the 2001 background study. These areas were developed based on the fill history and grouped so they represented areas at the site that were emplaced at about the same time and using geologically similar soils presumably derived from the same general borrow source or dredged material source area.

The background groundwater data consists of the results for specific shallow aquifer monitoring wells identified as representing background conditions in the 2001 background study. Raw analytical results were obtained from the TtEMI database for Alameda Point for:

- Soil samples representing the individual results used to generate the composite statistics for the "blue" background data set.
- Monitoring wells identified as belonging to the groundwater background data set.

The raw data facilitated the use of both graphical and numerical analytical techniques used in this new evaluation. Additionally, for background groundwater, additional data collected subsequent to the 2001 background study from the same monitoring wells identified in the study was included in the background data set for purposes of providing a more robust data set for graphical and numerical analysis.

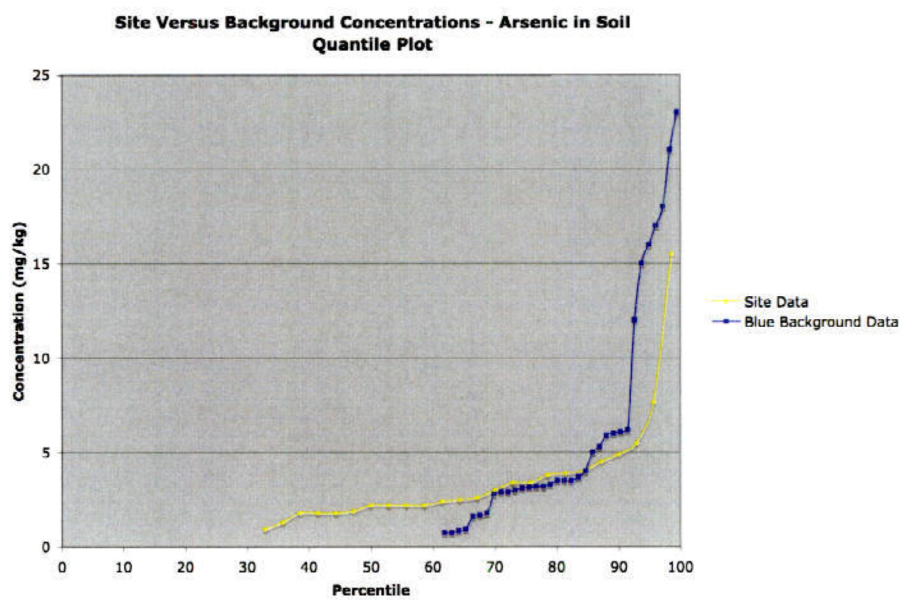
B3.0 RESULTS OF BACKGROUND EVALUATION

Summary statistics were calculated for the site and background data sets for soil and groundwater, as shown in Table 1 for soil and Table 2 for groundwater. The summary statistics are important in selecting the appropriate tests as identified in the procedural flow diagram shown in Figure 1. The background evaluation was then conducted on the data sets, and is discussed below by each of the major steps.

B3.1 STEP 1: QUANTILE TEST

Step 1 of the background evaluation utilized both a graphical quantile analysis using Microsoft Excel and a numerical quantile analysis using ChemStat 6.1 (a software package designed specifically for evaluating chemical data for RCRA compliance). Table 1 provides a summary of the results of these analyses for soil, and Table 2 provides a summary of the results of these analyses for groundwater. Representative quantile plots are shown below in Figure 2 (arsenic in soil) and Figure 3 (arsenic in groundwater). The quantile plots for the full set of metals are provided in Attachment 2.

Figure 2. Quantile Plot for Arsenic in Soil



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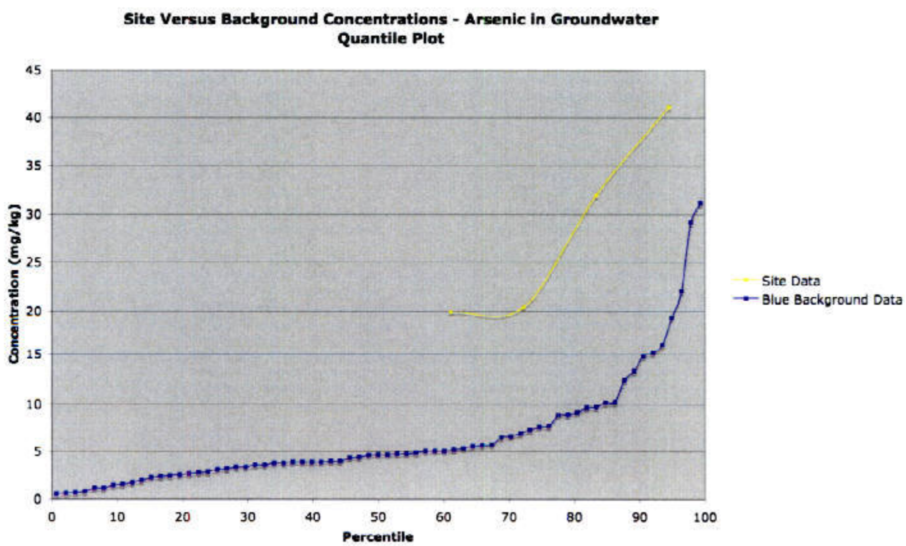
As shown in Figure 2, site data for arsenic in soil is generally lower than background data for arsenic, especially at the higher quantile range. Thus arsenic in soil is considered consistent with background and is not considered a COPC. However, given the significant effect arsenic in soil can have on the estimation of risk at the site, arsenic in soil was carried forward to Step 2 to confirm the findings.

Figure 3. Quantile Plot for Arsenic in Groundwater



As shown in Figure 3, site data for arsenic in groundwater is consistently higher than background data for arsenic across the entire quantile range. Thus arsenic in groundwater is tentatively identified as a COPC and will be carried forward to Step 2.

B3.2 STEP 2: NON-PARAMETRIC RANK SUM TEST

Based on the results of both the graphical and numerical quantile tests shown in Table 1 and Table 2, a subset of analytes were further anayzed in ChemStat 6.1 using either the Wilcoxon Rank Sum Test or Gehan Nonparametric Test, depending on the percentage of non-detects and other factors as identified in the procedural flow diagram (Figure 1).

Both the Wilcoxon Rank Sum Test or Gehan Nonparametric Test are statistical methods used to compare two data sets in order to evaluate whether they represent a single population or two distinct populations. A finding of "no statistically significant" difference indicates the two data sets are likely representative of a single population. In the case of IWTP 360 data, this finding for a specific metal would indicate there was no contribution of this metal to the soil or groundwater within the site by historic site operations. However, where a "statistically significant" difference is reported for a given metal, this would indicate historic site operations may have contributed this metal to soil or groundwater within the site.

Table 1 and Table 2 provide the results of the additional analysis for the remaining metals in soil and groundwater, respectively. A representative Gehan Test for arsenic in soil is shown in Figure 4 below.

Figure 4. Gehan Test for Arsenic in Soil

Gehan Non-Parametric Rank Test
Parameter: ARSENIC

Gehan Ranks

Point	Date	Result	d - e	Rank	a(R)
033-IWTP360-024	1/1/2000	ND<0.35	0 - 1	33.5	-43
B16-11	8/20/1998	ND<0.61 U	0 - 2	33.5	-43
B16-10	8/20/1998	ND<0.66 U	0 - 3	33.5	-43
B16-11	8/20/1998	ND<0.7 U	0 - 4	33.5	-43
M09-05	11/6/1998	ND<0.71 U	0 - 5	33.5	-43
B16-10	8/20/1998	ND<0.72 U	0 - 6	33.5	-43
M16-04	11/8/1998	0.74 J	1 - 6	37	-36
M16-04	11/8/1998	0.74 J	2 - 6	38	-34
B16-11	8/20/1998	ND<0.79 U	2 - 7	34.5	-41
B16-10	8/20/1998	ND<0.8 U	2 - 8	34.5	-41
M09-05	11/6/1998	0.84 J	3 - 8	40	-30
B16-12	8/20/1998	ND<0.88 U	3 - 9	35	-40
134-0014	1/1/2000	ND<0.88	3 - 10	35	-40
M09-05	11/6/1998	0.92 J	4 - 10	42	-26
134-0014M	1/1/2000	0.94	5 - 10	43	-24
033-IWTP360-019	1/1/2000	ND<1	5 - 11	36	-38
B16-12	8/20/1998	ND<1.2 U	5 - 12	36	-38
033-IWTP360-004	1/1/2000	ND<1.2	5 - 13	36	-38
134-0015M	1/1/2000	1.3	6 - 13	45.5	-19
B16-10	8/20/1998	ND<1.3 U	6 - 14	36.5	-37
033-IWTP360-003	1/1/2000	ND<1.4	6 - 15	36.5	-37
B16-12	8/20/1998	ND<1.4 U	6 - 16	36.5	-37
033-IWTP360-013	1/1/2000	ND<1.4	6 - 17	36.5	-37
B07C-11	8/18/1998	ND<1.5 U	6 - 18	36.5	-37
033-IWTP360-035	1/1/2000	ND<1.5	6 - 19	36.5	-37
MBG-3	5/30/1996	1.63	7 - 19	49.5	-11
MBG-3	5/30/1996	1.68	8 - 19	50.5	-9
033-IWTP360-001	1/1/2000	ND<1.7	8 - 20	37.5	-35
MBG-3	5/30/1996	1.8	9 - 20	52	-6
B07C-11	8/18/1998	ND<1.9 U	9 - 21	38	-34
B07C-11	8/18/1998	ND<1.9 U	9 - 22	38	-34
033-IWTP360-012	1/1/2000	ND<1.9	9 - 23	38	-34
MW410-1	7/2/1994	ND<1.9 U	9 - 24	38	-34
033-IWTP360-034	1/1/2000	ND<2	9 - 25	38	-34
B07C-12	8/18/1998	ND<2 U	9 - 26	38	-34
MW410-1	7/2/1994	ND<2.2 U	9 - 27	38	-34
033-IWTP360-021	1/1/2000	ND<2.3	9 - 28	38	-34
MW410-4	7/13/1994	ND<2.4 U	9 - 29	38	-34
MW410-1	7/2/1994	ND<2.4 U	9 - 30	38	-34
B410-9	7/13/1994	ND<2.4 U	9 - 31	38	-34
MW547-1	6/30/1994	ND<2.5 U	9 - 32	38	-34
MW410-4	7/13/1994	ND<2.5 U	9 - 33	38	-34
MW547-2	6/30/1994	ND<2.5 U	9 - 34	38	-34
MW547-1	6/30/1994	ND<2.5 U	9 - 35	38	-34
MW410-3	7/13/1994	ND<2.6 U	9 - 36	38	-34
B410-7	7/13/1994	ND<2.6 U	9 - 37	38	-34
MW547-2	6/30/1994	ND<2.7 U	9 - 38	38	-34
MW547-2	6/30/1994	ND<2.7 U	9 - 39	38	-34
MW547-1	6/30/1994	ND<2.8 U	9 - 40	38	-34
MW410-3	7/13/1994	ND<2.8 U	9 - 41	38	-34
MW547-1	6/30/1994	ND<2.8 U	9 - 42	38	-34
MW547-2	6/30/1994	ND<2.8 U	9 - 43	38	-34
MW410-4	7/13/1994	ND<2.8 U	9 - 44	38	-34
MW410-1	7/2/1994	2.8	10 - 44	65	20
MW410-3	7/13/1994	2.9	11 - 44	66	22
MW410-4	7/13/1994	ND<2.9 U	11 - 45	39	-32
MW410-3	7/13/1994	ND<2.9 U	11 - 46	39	-32
MW547-2	6/30/1994	2.9	12 - 46	68	26
MW410-3	7/13/1994	ND<2.9 U	12 - 47	39.5	-31
B410-7	7/13/1994	ND<3 U	12 - 48	39.5	-31
MW410-4	7/13/1994	ND<3 U	12 - 49	39.5	-31
B410-9	7/13/1994	ND<3 U	12 - 50	39.5	-31
MW547-1	6/30/1994	3	13 - 50	71	32
B410-9	7/13/1994	ND<3.1 U	13 - 51	40	-30
MW410-1	7/2/1994	3.1	14 - 51	72.5	35
MBG-3	5/30/1996	3.14	15 - 51	73.5	37
MW547-2	6/30/1994	3.2	16 - 51	74.5	39
B410-7	7/13/1994	3.2	17 - 51	75.5	41
B410-7	7/13/1994	3.3	18 - 51	76.5	43
033-IWTP360-015	1/1/2000	3.4	19 - 51	77.5	45
MW547-1	6/30/1994	3.5	20 - 51	78.5	47
MW410-1	7/2/1994	3.5	21 - 51	79.5	49
B410-9	7/13/1994	3.5	22 - 51	80.5	51
MW410-3	7/13/1994	3.7	23 - 51	81.5	53
033-IWTP360-018	1/1/2000	3.8	24 - 51	82.5	55
MW410-4	7/13/1994	4	25 - 51	83.5	57
033-IWTP360-022	1/1/2000	4	26 - 51	84.5	59
033-IWTP360-027	1/1/2000	4.5	27 - 51	85.5	61
033-IWTP360-028	1/1/2000	4.9	28 - 51	86.5	63
B410-7	7/13/1994	5	29 - 51	87.5	65
MW547-2	6/30/1994	5.3	30 - 51	88.5	67
B410-9	7/13/1994	5.9	31 - 51	89.5	69
B410-9	7/13/1994	6	32 - 51	90.5	71
B410-7	7/13/1994	6.1	33 - 51	91.5	73
MW410-1	7/2/1994	6.2	34 - 51	92.5	75
033-IWTP360-025	1/1/2000	7.7	35 - 51	93.5	77
B547-6	7/3/1994	ND<10 U	35 - 52	51	-8
MWC2-3	7/26/1994	ND<11 U	35 - 53	51	-8
B547-10	7/3/1994	ND<11 U	35 - 54	51	-8
BC2-7	7/25/1994	ND<12 U	35 - 55	51	-8
B547-10	7/3/1994	12	36 - 55	96.5	83
MWC2-3	7/26/1994	ND<12 U	36 - 56	51.5	-7
MWC2-3	7/26/1994	ND<12 U	36 - 57	51.5	-7
B547-6	7/3/1994	ND<12 U	36 - 58	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 59	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 60	51.5	-7
B547-10	7/3/1994	ND<12 U	36 - 61	51.5	-7
B547-6	7/3/1994	ND<12 U	36 - 62	51.5	-7
MWC2-3	7/26/1994	ND<12 U	36 - 63	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 64	51.5	-7
MWC2-3	7/26/1994	ND<13 U	36 - 65	51.5	-7
MWC2-3	7/26/1994	ND<13 U	36 - 66	51.5	-7
B547-6	7/3/1994	15	37 - 66	103	96
033-IWTP360-002	1/1/2000	15.5	38 - 66	104	98
B547-6	7/3/1994	16	39 - 66	105	100
B547-6	7/3/1994	17	40 - 66	106	102
B547-10	7/3/1994	18	41 - 66	107	104
B547-10	7/3/1994	21	42 - 66	108	106
B547-10	7/3/1994	23	43 - 66	109	108

Gehan Numerator = 8, Gehan Denominator Sum = 226908, Gehan Denominator = 185.229
Gehan Statistic = 0.0431897, Z = 1.64485 at 95% level of significance
0.0431897 < 1.64485, No Statistical Significance at 95% Confidence Level

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As shown in Figure 4, arsenic in soil is considered "consistent with" the background population, as there was no statistically significant difference between the site data and background data at the 95% confidence level, and thus arsenic in soil is not considered a COPC.

B3.3 STEP 3: IDENTIFICATION OF COPCs

A list of COPCs was then developed based on those metals that failed one or both the quantile tests (Step 1) and then failed the subsequent Wilcoxon Rank Sum Test or Gehan Nonparametric Test (Step 2). In the case of many of the metals in groundwater, the limited number of detected site results (less than 10) resulted in errors in both the numerical Quantile Test and Gehan Test method, making the statistical comparison impossible. In these instances, determination of whether the metal is a COPC was based on a conservative interpretation of the graphical quantile plot.

For soils and groundwater, the COPCs are presented below.

Soil	Groundwater
Barium	Arsenic
Calcium	Calcium
Chromium	Chromium
Chromium VI	Chromium VI
Cobalt	Nickel
Lead	Vanadium
Molybdenum	Zinc
Nickel	
Silver	

B3.4 STEP 4: CALCULATION OF EXPOSURE POINT CONCENTRATIONS (EPCs)

For those metals identified as a COPC in Steps 1 through 3 above, as summarized on Table 1 and Table 2, Exposure Point Concentrations (EPCs) were calculated. Due to requirements for updating the Human Health Risk Assessment, soil COPCs were evaluated based on the COPCs present within the 0-1 foot depth interval representing surface soil, and also within the 0-10 foot depth interval representing subsurface soil. Individual EPCs were calculated for each interval.

As shown in Table 1, several of the soil COPCs carried forward to Step 4 were either not analyzed at the surface depth interval (i.e., calcium and chromium VI), or were non-detect in all samples collected within the surface depth interval (i.e., molybdenum and silver). These metals were thus eliminated from the list of COPCs for the surface depth interval and EPCs were not calculated. A revised COPC list for the surface soil, subsurface soil, and groundwater is presented below.

Surface Soil	Subsurface Soil	Groundwater
Barium	Barium	Arsenic
Chromium	Calcium	Calcium
Cobalt	Chromium	Chromium
Lead	Chromium VI	Chromium VI
Nickel	Cobalt	Nickel
	Lead	Vanadium
	Molybdenum	Zinc
	Nickel	
	Silver	

Table 1 provides the EPCs for the COPCs identified above for site surface soil and site subsurface soil depth intervals, and Table 2 provides the EPCs for the COPCs identified above for site groundwater.

Table 1
Summary Statistics for Metals in Soil at IWTP360 and Comparison with Alameda Background

	Summary Statistics								
Parameter	IWTP360 Data Set			Blue Background Data Set			Site & Background		
	Total Samples	Non-Detects	% ND	Total Samples	Non-Detects	% ND	Total Samples	Non-Detects	% ND
Aluminum	18	0	0%	89	0	0%	107	0	0%
Antimony	35	35	100%	89	87	98%	124	122	98%
Arsenic	35	11	31%	89	55	62%	124	66	53%
Barium	35	0	0%	89	3	3%	124	3	2%
Beryllium	35	33	94%	89	64	72%	124	97	78%
Cadmium	120	108	90%	89	59	66%	209	167	80%
Calcium	18	0	0%	89	0	0%	107	0	0%
Chromium	120	0	0%	89	0	0%	209	0	0%
Hexavalent Chromium	22	13	59%		NA			NA	
Cobalt	35	0	0%	89	22	25%	124	22	18%
Copper	40	5	13%	89	5	6%	129	10	8%
Iron	33	0	0%	89	0	0%	122	0	0%
Lead	40	0	0%	89	61	69%	129	61	47%
Magnesium	18	0	0%	89	0	0%	107	0	0%
Manganese	18	0	0%	89	0	0%	107	0	0%
Mercury	35	25	71%	23	23	100%	58	48	83%
Molybdenum	35	33	94%	85	85	100%	120	118	98%
Nickel	40	0	0%	89	0	0%	129	0	0%
Potassium	18	0	0%	89	1	1%	107	1	1%
Selenium	35	35	100%	89	88	99%	124	123	99%
Silver	40	32	80%	89	87	98%	129	119	92%
Sodium	18	18	100%	89	20	22%	107	38	36%
Thallium	35	33	94%	89	88	99%	124	121	98%
Titanium		NA		66	0	0%		NA	
Vanadium	20	0	0%	89	0	0%	109	0	0%
Zinc	15	0	0%	89	0	0%	104	0	0%

Table 1

Summary Statistics for Metals in Soil at IWTP360 and Comparison with Alameda Background

	STEP 1		STEP 2		STEP 3
Parameter	Graphical Quantile Test	Numerical Quantile Test	Wilcoxen Rank Sum Test (<40%ND)	GEHAN Test (≥40%ND)	Is the Parameter a COPC?
	Site > Background		Site > Background		
Aluminum	No	No			No
Antimony	No	No			No
Arsenic	No	No			No
Barium	Yes	No	Yes		Yes
Beryllium	No	No			No
Cadmium	Yes	*Out of Range*		No	No
Calcium	Yes	Yes	Yes		Yes
Chromium	Yes	Out of Range	Yes		Yes
Hexavalent Chromium	Not Analyzed	Not Analyzed			Yes
Cobalt	Yes	No	Yes		Yes
Copper	No	No			No
Iron	No	No			No
Lead	Yes	Yes		Yes	Yes
Magnesium	No	No			No
Manganese	No	No			No
Mercury	Yes	Yes		No	No
Molybdenum	Yes	No		Yes	Yes
Nickel	Yes	Yes	Yes		Yes
Potassium	No	No			No
Selenium	No	No			No
Silver	Yes	Yes		Yes	Yes
Sodium	No	No			No
Thallium	No	No			No
Titanium	Not Analyzed	Not Analyzed			No
Vanadium	No	No			No
Zinc	No	No			No

Table 1
Summary Statistics for Metals in Soil at IWTP360 and Comparison with Alameda Background

Parameter	Surface Soils (Samples from 0-1 Foot)			STEP 4 Exposure Point Concentration	Methodology[1]	Subsurface Soils (Samples from 0-10 Feet)			STEP 4 Exposure Point Concentration	Methodology[1]
	Total Samples	Non-Detects	%ND	(mg/kg)		Total Samples	Non-Detects	%ND	(mg/kg)	
Aluminum										
Antimony										
Arsenic										
Barium	5	0	0%	5.95E+01	a	35	0	0%	3.35E+01	a
Beryllium										
Cadmium										
Calcium	0	0	NA	NA	Not a COPC	18	0	0%	3.91E+03	a
Chromium	5	0	0%	3.42E+01	a	68	0	0%	6.16E+01	a
Hexavalent Chromium	0	0	NA	NA	Not a COPC	22	13	59%	1.32E+00	b
Cobalt	5	0	0%	6.22E+00	a	35	0	0%	2.06E+00	a
Copper										
Iron										
Lead	5	0	0%	5.00E+00	a	40	0	0%	2.34E+01	a
Magnesium										
Manganese										
Mercury										
Molybdenum	5	5	100%	NA	Not a COPC	35	33	94%	5.10E+00	c
Nickel	5	0	0%	4.26E+01	a	40	0	0%	2.76E+01	a
Potassium										
Selenium										
Silver	5	5	100%	NA	Not a COPC	40	32	80%	1.05E+01	b
Sodium										
Thallium										
Titanium										
Vanadium										
Zinc										

[1] Exposure Point Concentration (EPC) calculated using the following means: a) <15% NDs by substituting 1/2DL for ND values and calculating 95% UCL using ProUCL; b) for ≥15% to ≤85% NDs, estimate the 95% UCL using the bounding approach per EPA 2002; and c) for >85% NDs, using the maximum value.

Table 2
Summary Statistics for Metals in Groundwater at IWTP360 and Comparison with Alameda Background

Parameter	Summary Statistics								
	IWTP360 Data Set			Background Data Set			Site & Background		
	Total Samples	Non-Detects	% ND	Total Samples	Non-Detects	% ND	Total Samples	Non-Detects	% ND
Aluminum	9	4	44%	355	240	68%	364	244	67%
Antimony	9	9	100%	353	282	80%	362	291	80%
Arsenic	9	5	56%	359	149	42%	368	154	42%
Barium	9	2	22%	355	39	11%	364	41	11%
Beryllium	9	9	100%	355	332	94%	364	341	94%
Cadmium	13	12	92%	355	321	90%	368	333	90%
Calcium	10	0	0%	359	4	1%	369	4	1%
Chromium	13	3	23%	355	270	76%	368	273	74%
Hexavalent Chromium	13	11	85%	14	12	86%	27	23	85%
Cobalt	9	9	100%	355	273	77%	364	282	77%
Copper	11	11	100%	355	202	57%	366	213	58%
Iron	9	2	22%	359	110	31%	368	112	30%
Lead	11	9	82%	356	294	83%	367	303	83%
Magnesium	9	9	100%	359	0	0%	368	9	2%
Manganese	9	1	11%	359	25	7%	368	26	7%
Mercury	9	9	100%	351	331	94%	360	340	94%
Molybdenum	9	2	22%	264	190	72%	273	192	70%
Nickel	11	4	36%	359	250	70%	370	254	69%
Potassium	9	9	100%	359	14	4%	368	23	6%
Selenium	9	9	100%	354	325	92%	363	334	92%
Silver	11	11	100%	347	336	97%	358	347	97%
Sodium	9	9	100%	359	2	1%	368	11	3%
Thallium	9	9	100%	347	340	98%	356	349	98%
Titanium		NA		3	0	0%		NA	
Vanadium	9	6	67%	359	189	53%	368	195	53%
Zinc	9	5	56%	359	207	58%	368	212	58%

Table 2
Summary Statistics for Metals in Groundwater at IWTP360 and Comparison with Alameda Background

Parameter	STEP 1 Graphical Quantile Test	STEP 1 Numerical Quantile Test	STEP 2 Wilcoxen Rank Sum Test (<40%ND)	STEP 2 GEHAN Test (≥40%ND)	STEP 3 Is the Parameter a COPC?
	Site > Background		Site > Background		
Aluminum	No	[1]			No
Antimony	No	[1]			No
Arsenic	Yes	[1]		[2]	Yes
Barium	No	[1]			No
Beryllium	No	[1]			No
Cadmium	No	[1]			No
Calcium	Yes	[1]	Yes		Yes
Chromium	Yes	[1]		Yes	Yes
Hexavalent Chromium	Yes	[1]		[2]	Yes
Cobalt	No	[1]			No
Copper	No	[1]			No
Iron	No	[1]			No
Lead	No	[1]			No
Magnesium	No	[1]			No
Manganese	No	[1]			No
Mercury	No	[1]			No
Molybdenum	No	[1]			No
Nickel	Yes	[1]		Yes	Yes
Potassium	No	[1]			No
Selenium	No	[1]			No
Silver	No	[1]			No
Sodium	No	[1]			No
Thallium	No	[1]			No
Titanium	Not Analyzed	Not Analyzed			No
Vanadium	Yes	[1]		[2]	Yes
Zinc	Yes	[1]		[2]	Yes

[1] Error, high background sample count with low site sample count out of range for numerical test method.
[2] Error, minimum of 10 samples needed for numerical analysis using Gehan Test method.

Table 2
Summary Statistics for Metals in Groundwater at IWTP360 and Comparison with Alameda Background

	STEP 4	
Parameter	Exposure Point Concentration (mg/L)	Methodology[3]
Aluminum		
Antimony		
Arsenic	2.35E-02	b
Barium		
Beryllium		
Cadmium		
Calcium	7.46E+01	a
Chromium	6.83E-02	b
Hexavalent Chromium	2.00E-02	c
Cobalt		
Copper		
Iron		
Lead		
Magnesium		
Manganese		
Mercury		
Molybdenum		
Nickel	2.84E-02	b
Potassium		
Selenium		
Silver		
Sodium		
Thallium		
Titanium		
Vanadium	2.96E-02	b
Zinc	2.27E-02	b

[3] Exposure Point Concentration (EPC) calculated using the following means: a) <15% NDs by substituting 1/2DL for ND values and calculating 95% UCL using ProUCL; b) for ≥15% to ≤85% NDs, estimate the 95% UCL using the bounding approach per EPA 2002; and c) for >85% NDs, using the maximum value.

Attachment 1. Copy of *Summary of Background Concentrations in Soil and Groundwater* (December 2001) and TtEMI Tables 3.1 and 3.2

SUMMARY OF BACKGROUND CONCENTRATIONS IN SOIL AND GROUNDWATER

ALAMEDA POINT
ALAMEDA, CALIFORNIA

TC.0245.11326

DECEMBER 2001

Department of the Navy
Engineering Field Activity West
San Bruno, California 94066-2402

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN II)
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Prepared for
Southwest Division
Naval Facilities Engineering Command
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SUMMARY OF BACKGROUND CONCENTRATIONS IN SOIL AND GROUNDWATER

ALAMEDA POINT
ALAMEDA, CALIFORNIA

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DECEMBER 2001

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1.0 INTRODUCTION AND PURPOSE

Background concentrations of naturally occurring chemicals in soil and for metals in shallow groundwater have been established for Naval Air Station Alameda Point (Alameda Point) using an analytical database gathered during the course of the Alameda Point Remedial Investigation (RI). Soil samples from the database were selected to represent the three distinct fill areas identified from the RI data. Groundwater samples from the data base were selected from the shallow or first water bearing zone (FWBZ). The purpose of this technical memorandum is to summarize PRC (1979), Terranext (1997), and Tetra Tech (1998) documents that were prepared to present the basis used to establish the background soil and groundwater concentrations at Alameda Point.

2.0 BACKGROUND PROJECT HISTORY

Alameda Point was constructed using fill material dredged from the Oakland Inner Harbor, San Francisco Bay, and the ship channel and Seaplane Lagoon area over a period of 88 years (1887 to 1975). The history of Alameda Point's construction indicates that almost the entire installation is located on marshland, tidal flats, and bay margin (submerged land) that has been filled with the dredged sediment. The species and concentrations of metals and polycyclic aromatic hydrocarbons (PAH) present in the fill sediment are not known, but they may have been impacted by industrial activities along the original Oakland shoreline in San Francisco Bay and Alameda Island before the dredged material was placed as fill.

From the late 1800s until the 1920s, two gas plants and an oil refinery were located near the future locations of the Alameda Annex and Alameda Point. These facilities are believed to have discharged petroleum waste to adjacent marshlands. The waste migrated over much of the surface of the surrounding marshlands and was deposited on the marsh surface through tidal actions, leaving a layer of contaminated sediment under what would later become the Alameda Annex and the eastern portion of Alameda Point. This layer is referred to as the marsh crust. Further west, at Alameda Point, the waste was deposited on tidal flats, now known as the former sub tidal area. Fill material dredged from the Oakland Inner Harbor and surrounding San Francisco Bay was placed on these areas from as early as 1887 to as late as 1975, covering the former sub tidal area and marsh crust with the fill.

Background information is typically collected and analyzed iteratively as part if the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. CERCLA Section 104(3)(a) specifically states: "The President shall not provide for a removal or remedial action under this section in response to a release or threat of a release of a naturally occurring substance in its unaltered form, or altered solely through naturally occurring processes or phenomena, from a location where it is naturally found." In a site investigation, determining if a release has occurred requires that information regarding background conditions be available. According to United States Environmental Protection Agency (EPA) (1989), background chemicals can be categorized as either:

- Nonanthropogenic or naturally occurring: minerals or other substances present in the environment in forms that have not been influenced by human activities
- Anthropogenic: natural and manmade substances present in the environment as a result of human activities not specifically related to site activities

Nonanthropogenic chemicals are naturally occurring organic or inorganic chemicals that are present in soil or groundwater as part of the geological or hydrogeological conditions of the area and are in an unaltered form not related to human activity (for example, metals from rock formations or PAH from forest fires). Anthropogenic background chemicals are related to human activity in the region but are unrelated to Navy operations. Metals and PAHs at Alameda Point may be considered anthropogenic background chemicals because of potential sources such as the fill material, car exhaust, and the marsh crust.

The following sections focus on chemical concentrations in soils and groundwater considered to be representative of site-specific background conditions at Alameda Point. The soil and groundwater background conditions were determined using a series of statistical tests conducted on site-specific background data selected for each medium at Alameda Point. The statistical evaluation methodology for soils is described in the "Final Statistical Methodology for Background Comparisons" report (PRC 1997a). The methodology and results for groundwater are described in a technical memorandum for estimation of background metal concentrations in shallow groundwater (TtEMI 1998). Section 3 provides a summary description of the determination of site-specific background conditions in soil at Alameda Point. Section 4 provides a summary of a detailed description of the determination of site-specific background conditions in groundwater at Alameda Point.

3.0 SOIL BACKGROUND DETERMINATION METHODOLOGY

Because the fill material was dredged from various locations in the bay, there is substantial variation in the lithology of the fill material across the installation. The thickness of the fill material also varies across the installation. Five discrete fill areas were initially identified for determining the variability in the fill material encountered across the installation. The five areas were the far western portion of the installation (CERCLA Site 1/CERCLA Site 2 area), a small strip of land bordering the Oakland Inner Harbor, the runway area from east of the runway to the installation boundary, and two areas within the southeastern corner of the installation.

PRC (1997) and Terranext (1997) provide a detailed description of the site-specific background data selection process. The methodology used in developing the site-specific soil background data for Alameda Point consisted of three steps that are discussed briefly. The three steps were as follows:

- Division of the installation into areas with geologically similar soils that could be represented by a single site-specific background data set
- Review of the Installation Restoration Program (IRP) database for selection of appropriate site-specific background samples
- Statistical analyses of data sets for each area to determine site-specific background concentrations

Site-specific soil background concentrations at Alameda Point were determined for inorganic chemicals and PAHs. Inorganic chemicals present in natural soil compositions are considered nonanthropogenic. Concentrations of inorganic chemicals also may be affected by non-site-related anthropogenic activities. Random detections of PAHs in samples collected from the fill material in many areas of Alameda Point are considered to be anthropogenic for the following reasons:

- RWQCB lists a total background level of PAH in San Francisco Bay sediment of 5.13 milligrams per kilogram (mg/kg) (RWQCB 1996). Because Alameda Point was constructed using dredged bay sediment, if the total concentration of PAH detected in soils at Alameda Point at or below this concentration, then the PAH is likely to represent background bay levels.

Because of the installation's urban location, soil at Alameda Point is expected to contain background levels of PAHs. The Agency for Toxic Substances and Disease Registry (ATSDR) has published general background PAH concentrations for urban soils as high as 62 and 166 mg/kg for heavy and light molecular weight PAHs, respectively (ATSDR 1995).

3.1 DIVISION INTO SIMILAR AREAS

Iron and manganese data were statistically compared to determine whether these areas contained geologically similar soils and could be represented by one site-specific background data set. Results of the statistical comparison indicated some areas could be combined but more than one data set would be needed to represent site-specific background concentrations for the entire installation. Therefore, the five initially identified areas were reduced to three representative background areas. Specifically, the, pink (fill area 1), blue (fill area 2), and yellow (fill area 3) areas shown in Figure 1 were designated as representative background areas for Alameda Point. The parts of the installation included in each of the three site-specific background areas are listed below.

- Pink area: runway area and central portion of the installation (Fill Area 1)
- Blue area: southeastern portion of the installation (Fill Area 2)
- Yellow area: far western portion of the installation (Fill Area 3)

3.2 RI DATABASE REVIEW

Soil samples collected as part of the IRP investigation were reviewed on a sample-by-sample basis to select samples that could represent site-specific background concentrations. The data review was conducted in accordance with regulatory guidance (DTSC 1994).

Selection of the site-specific background data for each of the three background areas listed above in Section 3.1 consisted of the following steps:

- Samples collected from CERCLA sites were excluded as background samples.

- Samples collected from soil borings that contained non-PAH organic chemicals, except for insignificant levels of laboratory contaminants and organic carbon, were excluded as background samples.

Samples that passed these three screening steps were considered to be potential background samples. For the three areas identified above, 247 samples were selected from the IRP database as potential background samples. Table 1 provides a list of the sample identification numbers and depth intervals for all the samples selected. A total of 51, 56, and 140 samples were identified as potential background samples for the yellow, pink, and blue areas, respectively.

3.3 STATISTICAL ANALYSIS

This section provides a summary of the statistical methods used to determine the background concentrations.

3.3.1 Determination of Inorganic Background Concentrations

Data sets established for the three background areas were statistically evaluated using a methodology described in the "Final Statistical Methodology for Background Comparisons" report (PRC 1997a). Tables 1and 2 present the selected samples in the background data set. Tables 2 through 4 present the background data summary for each of the fill areas (PRC 1997b).

The 80th percent lower confidence limit (LCL) of the 95th percentile of the distribution (80 LCL/95) concentrations for inorganic chemicals were calculated using the formula presented in the Statistical Methodology for Background Comparisons (Alameda Point), which can also be found in Statistical Methods for Environmental pollution Monitoring (Gilbert 1987). The calculation was performed on untransformed data for normally distributed data and for data for which a distribution could not be determined (Terranext 1997).

3.3.2 Determination of Background PAH Concentrations

The fill material was placed within Alameda Point prior to any Navy activities that could have released PAHs to the environment. Based on the most recent background data presented in PRC (1997), the Navy considers the random detections of PAHs in fill to be anthropogenic. However, an additional background study for PAHs has been scheduled to confirm or deny this assertion.

The methodology used to develop the forthcoming Alameda Point background PAH data set will be described in a technical memorandum to be prepared in the Fall 2002.

4.0 GROUNDWATER BACKGROUND DETERMINATION METHODOLOGY

Metals occur naturally in groundwater at concentrations that vary among locations. These inherent variations on metals concentrations can potentially arise from several factors including:

- Differences in overlying soil characteristics in the recharge zone
- Differences in subsurface hydrostratigraphy
- Differences in geochemistry
- Position within the groundwater flow system

Because background concentrations of metals in groundwater are expected to vary among locations within a single hydrostratigraphic unit, it is appropriate to consider background concentrations as a distribution of values rather than a single value due to natural variation of metals in the environment. Some concentrations of metals in groundwater at Alameda Point may not be naturally occurring but are unrelated to Navy activities at the installation.

During technical meetings between the Navy and regulatory agencies held on April 28 and 29, 1998, the base clean-up team (BCT) decided to follow a statistical approach for determination of the concentrations of background metals in groundwater similar to that used to determine the concentrations of background metals in soils at Alameda Point (PRC 1997). This simplified approach was followed because of the transitory nature of groundwater and the following factors arising from the construction of Alameda Point:

- The presence of anthropogenic metals in fill sediment
- The slow leaching of both naturally occurring and anthropogenic metals from the marine sediment into the groundwater
- The marine-derived fill sediment being placed in a column of seawater and serving as the aquifer material
- The disequilibria of groundwater chemistry because of the slow flushing of saline connate water from the pore spaces and the large geochemical gradients that occur within small horizontal and vertical distances
- Existing and potential future seawater intrusion induced by remediation- or supply-based pumping

In consultation with the BCT, the Navy proposed estimating the concentration limits of background metals in groundwater in the following manner:

- Select well locations that appear to be unaffected by CERCLA site-related contamination to create an initial data set to be used to determine background concentrations of metals

- Compare all organic groundwater data from the initial data set to the 1996 tap water preliminary remediation goals (PRG) to exclude impacted wells

- Examine the initial data set using probability plots and Rosner's test to exclude outlier concentrations of metals

- Test the remaining data (without outliers) for normality using a statistical graphics program

- Prepare summary statistics and estimate the background concentrations of metals using the tested data set

A subsequent meeting between the regulatory agencies and the Navy was held on May 11, 1998, during which 35 monitoring wells were identified at Alameda Point for potential use in developing site-specific background groundwater concentrations. Figures 2 through 4 show the locations of the 35 unaffected (background) wells selected during the meeting.

The data set used to determine the concentrations of background metals in groundwater was limited to data for groundwater samples collected from the FWBZ. Data for groundwater samples collected from the second water bearing zone were not included in the data set because of extensive saltwater intrusion and the inherent inability of analytical methods to detect trace metals in the presence of very high levels of marine salts. A detailed description of the process used to develop the background metal data set and the statistical procedure used to estimate the concentrations of background metals in groundwater at Alameda Point is provided in "Technical Memorandum Estimation of Ambient Metal Concentration s In Shallow Groundwater" (TtEMI 1998). Table 5 summarizes the background concentrations of metals in shallow groundwater at Alameda Point.

Table 5 also presents the results of the statistical procedure, providing estimated background metal concentrations at both the 80 LCL/95 and at the 95th percent upper confidence limit (95 UCL) for shallow groundwater (FWBZ) at Alameda Point, statistical features of the data set, and relevant water quality information. The estimated concentrations of background metals in groundwater at the 80 LCL/95 in many cases exceeded the maximum contaminant levels (MCL) for a municipal water supply (RWQCB 1995). Specifically, the estimated concentrations of antimony, cadmium, iron, manganese, and thallium exceeded their respective MCLs.

5.0 CONCLUSIONS

Background concentrations of inorganic and organic constituents in soil and groundwater at Alameda Point were estimated using accepted statistical methodologies approved by the Navy. The number of samples and the areal distribution of samples within each of the three fill areas meets concerns of sufficient statistical power, confidence, and spatial representation of the data. The background concentrations can be used to conduct test of means to select chemicals of potential concern. Certain concentrations of metals and PAH in soil and groundwater at Alameda Point may be considered anthropogenic background chemicals because of potential sources such as fill material, car exhaust, and the marsh crust.

Current Navy guidance sets (Navy 1998, 1999) provides a number of different techniques for determining if site data are different from the background data. These guidance documents should be consulted to determine the most appropriate method. The confidence limits in Tables 1 and 2 can be used as an initial screen to determine which site constituents do not exceed background. If the maximum concentration for a given constituent does not exceed the background threshold value, it is unlikely that the constituent is greater than background. However, the background thresholds should not be used to make final determinations about background if the maximum constituent concentration from a site exceeds this confidence limit. Alternative techniques should be employed.

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TABLES

TABLE 1

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	280-S09-001	1.5	2.5	M09-05
BLUE	280-S09-002	3.0	4.0	M09-05
BLUE	280-S09-003	5.0	6.0	M09-05
BLUE	280-S16-018	0.5	1.5	B16-10
BLUE	280-S16-019	2.5	3.5	B16-10
BLUE	280-S16-020	3.5	4.5	B16-10
BLUE	280-S16-021	5.0	6.0	B16-10
BLUE	280-S16-022	1.5	2.5	B16-11
BLUE	280-S16-023	2.5	3.5	B16-11
BLUE	280-S16-024	5.0	6.0	B16-11
BLUE	280-S16-025	0.5	1.5	B16-12
BLUE	280-S16-026	2.5	3.5	B16-12
BLUE	280-S16-027	5.0	6.0	B16-12
BLUE	280-S16-028	1.0	2.0	M16-04
BLUE	280-S16-029	2.0	3.0	M16-04
BLUE	280-S7C-001	0.5	1.5	B07C-11
BLUE	280-S7C-002	2.5	3.5	B07C-11
BLUE	280-S7C-003	5.0	6.0	B07C-11
BLUE	280-S7C-004	0.5	1.5	B07C-12
BLUE	B410-7 [1.0-1.5]	1.0	1.5	B410-7
BLUE	B410-7 [3.0-3.5]	3.0	3.5	B410-7
BLUE	B410-7 [5.5-6.0]	5.5	6.0	B410-7
BLUE	B410-7 [6.0-6.5]	6.0	6.5	B410-7
BLUE	B410-7 [8.5-9.0]	8.5	9.0	B410-7
BLUE	B410-7 [9.0-9.5]	9.0	9.5	B410-7
BLUE	B410-7 [11.0-11.5]	11.0	11.5	B410-7
BLUE	B410-7 [11.5-12.0]	11.5	12.0	B410-7
BLUE	B410-7 [14.5-15.0]	14.5	15.0	B410-7
BLUE	B410-7 [15.0-15.5]	15.0	15.5	B410-7
BLUE	B410-9 [1.0-1.5]	1.0	1.5	B410-9
BLUE	B410-9 [2.5-3.0]	2.5	3.0	B410-9
BLUE	B410-9 [3.0-3.5]	3.0	3.5	B410-9
BLUE	B410-9 [5.5-6.0]	5.5	6.0	B410-9
BLUE	B410-9 [6.0-6.5]	6.0	6.5	B410-9
BLUE	B410-9 [8.5 -9.0]	8.5	9.0	B410-9
BLUE	B410-9 [9.0-9.5]	9.0	9.5	B410-9
BLUE	B410-9 [11.5-12.0]	11.5	12.0	B410-9
BLUE	B410-9 [12.0-12.5]	12.0	12.5	B410-9
BLUE	B410-9 [14.5-15.0]	14.5	15.0	B410-9
BLUE	B410-9 [15.0-15.5]	15.0	15.5	B410-9
BLUE	B547-10 [0.5-1.0]	0.5	1.0	B547-10
BLUE	B547-10 [2.0-2.5]	2.0	2.5	B547-10
BLUE	B547-10 [2.5-3.0]	2.5	3.0	B547-10
BLUE	B547-10 [5.0-5.5]	5.0	5.5	B547-10
BLUE	B547-10 [5.5-6.0]	5.5	6.0	B547-10

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TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	B547-10 [8.0-8.5]	8.0	8.5	B547-10
BLUE	B547-10 [8.5-9.0]	8.5	9.0	B547-10
BLUE	B547-10 [11.0-11.5]	11.0	11.5	B547-10
BLUE	B547-10 [11.5-12.0]	11.5	12.0	B547-10
BLUE	B547-10 [14.0-14.5]	14.0	14.5	B547-10
BLUE	B547-10 [14.5-15.0]	14.5	15.0	B547-10
BLUE	B547-6 [2.0-2.5]	2.0	2.5	B547-6
BLUE	B547-6 [2.5-3.0]	2.5	3.0	B547-6
BLUE	B547-6 [3.5-4.0]	3.5	4.0	B547-6
BLUE	B547-6 [4.0-5.0]	4.0	5.0	B547-6
BLUE	B547-6 [5.0-5.5]	5.0	5.5	B547-6
BLUE	B547-6 [6.0-6.5]	6.0	6.5	B547-6
BLUE	B547-6 [6.5-7.0]	6.5	7.0	B547-6
BLUE	B547-6 [9.0-9.5]	9.0	9.5	B547-6
BLUE	B547-6 [9.5-10.0]	9.5	10.0	B547-6
BLUE	B547-6 [11.0-11.5]	11.0	11.5	B547-6
BLUE	B547-6 [11.5-12.0]	11.5	12.0	B547-6
BLUE	B547-6 [14.0-14.5]	14.0	14.5	B547-6
BLUE	B547-6 [14.5-15.0]	14.5	15.0	B547-6
BLUE	BC2-7 [0.5-1.0]	0.5	1.0	BC2-7
BLUE	BC2-7 [2.5-3.0]	2.5	3.0	BC2-7
BLUE	BC2-7 [5.0-5.5]	5.0	5.5	BC2-7
BLUE	BC2-7 [7.0-7.5]	7.0	7.5	BC2-7
BLUE	BC2-7 [9.5-10.0]	9.5	10.0	BC2-7
BLUE	BC2-7 [11.0-11.5]	11.0	11.5	BC2-7
BLUE	BC2-7 [13.5-14.0]	13.5	14.0	BC2-7
BLUE	BC2-7 [14.0-14.5]	14.0	14.5	BC2-7
BLUE	M-BG3-000	0.3	0.5	MBG-3
BLUE	M-BG3-002	2.0	2.5	MBG-3
BLUE	M-BG3-004	4.0	4.5	MBG-3
BLUE	M-BG3-006	5.5	6.0	MBG-3
BLUE	MW410-1 [0.5-1.0]	0.5	1.0	MW410-1
BLUE	MW410-1 [2.0-2.5]	2.0	2.5	MW410-1
BLUE	MW410-1 [3.0-3.5]	3.0	3.5	MW410-1
BLUE	MW410-1 [5.5-6.0]	5.5	6.0	MW410-1
BLUE	MW410-1 [6.5-7.0]	6.5	7.0	MW410-1
BLUE	MW410-1 [7.0-7.5]	7.0	7.5	MW410-1
BLUE	MW410-1 [7.5-8.0]	7.5	8.0	MW410-1
BLUE	MW410-1 [8.0-8.5]	8.0	8.5	MW410-1
BLUE	MW410-1 [11.0-11.5]	11.0	11.5	MW410-1
BLUE	MW410-1 [11.5-12.0]	11.5	12.0	MW410-1
BLUE	MW410-1 [12.5-13.0]	12.5	13.0	MW410-1
BLUE	MW410-1 [14.0-14.5]	14.0	14.5	MW410-1
BLUE	MW410-1 [14.5-15.0]	14.5	15.0	MW410-1
BLUE	MW410-3 [1.0-1.5]	1.0	1.5	MW410-3
BLUE	MW410-3 [3.0-3.5]	3.0	3.5	MW410-3
BLUE	MW410-3 [4.0-4.5]	4.0	4.5	MW410-3
BLUE	MW410-3 [5.5-6.0]	5.5	6.0	MW410-3
BLUE	MW410-3 [6.0-6.5]	6.0	6.5	MW410-3

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	MW410-3 [8.5-9.0]	8.5	9.0	MW410-3
BLUE	MW410-3 [9.0-9.5]	9.0	9.5	MW410-3
BLUE	MW410-3 [11.5-12.0]	11.5	12.0	MW410-3
BLUE	MW410-3 [12.0-12.5]	12.0	12.5	MW410-3
BLUE	MW410-3 [14.5-15.0]	14.5	15.0	MW410-3
BLUE	MW410-3 [15.0-15.5]	15.0	15.5	MW410-3
BLUE	MW410-4 [1.0-1.5]	1.0	1.5	MW410-4
BLUE	MW410-4 [3.0-3.5]	3.0	3.5	MW410-4
BLUE	MW410-4 [4.0-4.5]	4.0	4.5	MW410-4
BLUE	MW410-4 [5.5-6.0]	5.5	6.0	MW410-4
BLUE	MW410-4 [6.0-6.5]	6.0	6.5	MW410-4
BLUE	MW410-4 [8.5-9.0]	8.5	9.0	MW410-4
BLUE	MW410-4 [9.0-9.5]	9.0	9.5	MW410-4
BLUE	MW410-4 [11.5-12.0]	11.5	12.0	MW410-4
BLUE	MW410-4 [12.0-12.5]	12.0	12.5	MW410-4
BLUE	MW410-4 [14.5-15.0]	14.5	15.0	MW410-4
BLUE	MW410-4 [15.0-15.5]	15.0	15.5	MW410-4
BLUE	MW547-1 [0.5-1.0]	0.5	1.0	MW547-1
BLUE	MW547-1 [2.0-2.5]	2.0	2.5	MW547-1
BLUE	MW547-1 [2.5-3.0]	2.5	3.0	MW547-1
BLUE	MW547-1 [4.5-5.0]	4.5	5.0	MW547-1
BLUE	MW547-1 [5.0-5.5]	5.0	5.5	MW547-1
BLUE	MW547-1 [8.0-8.5]	8.0	8.5	MW547-1
BLUE	MW547-1 [8.5-9.0]	8.5	9.0	MW547-1
BLUE	MW547-1 [11.0-11.5]	11.0	11.5	MW547-1
BLUE	MW547-1 [11.5-12.0]	11.5	12.0	MW547-1
BLUE	MW547-1 [14.0-14.5]	14.0	14.5	MW547-1
BLUE	MW547-1 [14.5-15]	14.5	15.0	MW547-1
BLUE	MW547-2 [0.5-1.0]	0.5	1.0	MW547-2
BLUE	MW547-2 [2.0-2.5]	2.0	2.5	MW547-2
BLUE	MW547-2 [2.5-3.0]	2.5	3.0	MW547-2
BLUE	MW547-2 [5.0-5.5]	5.0	5.5	MW547-2
BLUE	MW547-2 [5.5-6.0]	5.5	6.0	MW547-2
BLUE	MW547-2 [6.0-6.5]	6.0	6.5	MW547-2
BLUE	MW547-2 [6.5-7.0]	6.5	7.0	MW547-2
BLUE	MW547-2 [9.5-10.0]	9.5	10.0	MW547-2
BLUE	MW547-2 [10.0-10.5]	10.0	10.5	MW547-2
BLUE	MW547-2 [12.5-13.0]	12.5	13.0	MW547-2
BLUE	MW547-2 [13.0-13.5]	13.0	13.5	MW547-2
BLUE	MW547-2 [14.0-14.5]	14.0	14.5	MW547-2
BLUE	MW547-2 [14.5-15.0]	14.5	15.0	MW547-2
BLUE	MWC2-3 [1.0-1.5]	1.0	1.5	MWC2-3
BLUE	MWC2-3 [4.0-4.5]	4.0	4.5	MWC2-3
BLUE	MWC2-3 [5.0-5.5]	5.0	5.5	MWC2-3
BLUE	MWC2-3 [6.5-7.0]	6.5	7.0	MWC2-3
BLUE	MWC2-3 [7.0-7.5]	7.0	7.5	MWC2-3
BLUE	MWC2-3 [8.0-8.5]	8.0	8.5	MWC2-3
BLUE	MWC2-3 [8.5-9.0]	8.5	9.0	MWC2-3
BLUE	MWC2-3 [9.5-10.0]	9.5	10.0	MWC2-3

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	MWC2-3 [10.0-10.5]	10.0	10.5	MWC2-3
BLUE	MWC2-3 [11.0-11.5]	11.0	11.5	MWC2-3
BLUE	MWC2-3 [12.5-13.0]	12.5	13.0	MWC2-3
PINK	280-RA-033	0.0	1.5	M112-A
PINK	280-RA-034	2.5	3.5	M112-A
PINK	280-RA-035	5.0	6.0	M112-A
PINK	280-RA-039	0.0	1.0	M114-A
PINK	280-RA-040	2.0	3.0	M114-A
PINK	280-RA-041	3.5	4.5	M114-A
PINK	280-RA-042	0.0	1.5	M115-E
PINK	280-RA-043	2.5	3.5	M115-E
PINK	280-RA-044	5.0	6.0	M115-E
PINK	280-RA-045	0.0	1.5	M116-E
PINK	280-RA-046	2.5	3.5	M116-E
PINK	280-RA-047	5.0	6.0	M116-E
PINK	280-RA-048	0.0	1.5	M117-E
PINK	280-RA-049	2.5	3.5	M117-E
PINK	280-RA-050	5.0	6.0	M117-E
PINK	B06-07-000	0.5	1.0	B06-07
PINK	B06-07-002	2.0	3.3	B06-07
PINK	B06-07-007	6.5	7.5	B06-07
PINK	B06-07-008	8.0	9.5	B06-07
PINK	B06-08-000	1.0	1.5	B06-08
PINK	B06-08-002	2.0	3.0	B06-08
PINK	B07B-02-000	0.5	1.5	B07B-02
PINK	B07B-02-004	3.5	5.0	B07B-02
PINK	B10-04-000	0.5	1.0	B10-04
PINK	B10-04-005	5.0	6.0	B10-04
PINK	B12-08-000	0.5	1.0	B12-08
PINK	B12-08-004	3.5	5.0	B12-08
PINK	B12-08-010	9.5	10.0	B12-08
PINK	F10 [0.0-0.0]	0.0	0.0	F-10
PINK	M-006A-0	2.0	2.5	M006-A
PINK	M-006A-005	3.5	4.5	M006-A
PINK	M-101A-004	2.0	3.5	M101-A
PINK	M-102A-004	2.0	3.3	M102-A
PINK	M-106A-0	0.0	0.0	M106-A
PINK	M-106A-003	2.0	3.0	M106-A
PINK	M-107A-0	0.0	0.0	M107-A
PINK	M-107A-002	0.5	2.0	M107-A
PINK	M-109A-0	0.0	0.0	M109-A
PINK	M-109A-007	5.5	6.3	M109-A
PINK	M-110A-003	1.5	3.0	M110-A
PINK	M-111A-0	0.5	0.0	M111-A
PINK	M-111A-003	2.0	3.5	M111-A
PINK	M-BG1-002	2.0	2.5	MBG-1
PINK	M-BG1-003	3.0	3.5	MBG-1
PINK	M-BG1-004	5.0	5.5	MBG-1

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
PINK	M-BG2-002	2.0	2.5	MBG-2
PINK	M-BG2-005	5.0	5.5	MBG-2
PINK	M-BG4-002	2.0	2.5	MBG-4
PINK	M-BG4-007	7.5	8.0	MBG-4
PINK	M-BG4-010	10.0	10.5	MBG-4
PINK	M103-A	5.0	6.5	M103-A
PINK	M103-B	0.0	0.5	M103-B
PINK	M105-A	5.5	7.0	M105-A
PINK	M105-B	0.0	0.5	M105-B
PINK	M108-A	5.0	6.5	M108-A
PINK	M108-B	0.0	0.5	M108-B
YELLOW	280-S01-016	0.0	0.0	SS1-RA-14
YELLOW	A2 [0.0-0.0]	0.0	0.0	A-2
YELLOW	A3 [0.0-0.0]	0.0	0.0	A-3
YELLOW	A4 [0.0-0.0]	0.0	0.0	A-4
YELLOW	A5 [0.0-0.0]	0.0	0.0	A-5
YELLOW	A6 [0.0-0.0]	0.0	0.0	A-6
YELLOW	A7 [0.0-0.0]	0.0	0.0	A-7
YELLOW	A8 [0.0-0.0]	0.0	0.0	A-8
YELLOW	B2 [0.0-0.0]	0.0	0.0	B-2
YELLOW	B3 [0.0-0.0]	0.0	0.0	B-3
YELLOW	B4 [0.0-0.0]	0.0	0.0	B-4
YELLOW	B5 [0.0-0.0]	0.0	0.0	B-5
YELLOW	B6 [0.0-0.0]	0.0	0.0	B-6
YELLOW	B7 [0.0-0.0]	0.0	0.0	B-7
YELLOW	B8 [0.0-0.0]	0.0	0.0	B-8
YELLOW	F1 [0.0-0.0]	0.0	0.0	F-1
YELLOW	F2 [0.0-0.0]	0.0	0.0	F-2
YELLOW	F3 [0.0-0.0]	0.0	0.0	F-3
YELLOW	F4 [0.0-0.0]	0.0	0.0	F-4
YELLOW	F5 [0.0-0.0]	0.0	0.0	F-5
YELLOW	F6 [0.0-0.0]	0.0	0.0	F-6
YELLOW	F9 [0.0-0.0]	0.0	0.0	F-9
YELLOW	G2 [0.0-0.0]	0.0	0.0	G-2
YELLOW	G3 [0.0-0.0]	0.0	0.0	G-3
YELLOW	G5 [0.0-0.0]	0.0	0.0	G-5
YELLOW	G8 [0.0-0.0]	0.0	0.0	G-8
YELLOW	G9 [0.0-0.0]	0.0	0.0	G-9
YELLOW	H8 [0.0-0.0]	0.0	0.0	H-8
YELLOW	H9 [0.0-0.0]	0.0	0.0	H-9
YELLOW	I7 [0.0-0.0]	0.0	0.0	I-7
YELLOW	I8 [0.0-0.0]	0.0	0.0	I-8
YELLOW	J7 [0.0-0.0	0.0	0.0	J-7
YELLOW	J8 [0.0-0.0]	0.0	0.0	J-8
YELLOW	K6 [0.0-0.0]	0.0	0.0	K-6
YELLOW	K7 [0.0-0.0]	0.0	0.0	K-7
YELLOW	L5 [0.0-0.0]	0.0	0.0	L-5
YELLOW	L6 [0.0-0.0]	0.0	0.0	L-6

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
YELLOW	L7 [0.0-0.0]	0.0	0.0	L-7
YELLOW	M-004A-0	2.0	2.5	M004-A
YELLOW	M-004A-004	3.5	4.5	M004-A
YELLOW	M-005A-0	0.5	1.5	M005-A
YELLOW	M-005A-003	2.0	2.5	M005-A
YELLOW	M-008A-0	0.5	1.8	M008-A
YELLOW	M-008A-004	2.0	3.3	M008-A
YELLOW	M-025A-004	4.0	0.0	M025-A
YELLOW	M4 [0.0-0.0]	0.0	0.0	M-4
YELLOW	M5 [0.0-0.0]	0.0	0.0	M-5
YELLOW	M6 [0.0-0.0]	0.0	0.0	M-6
YELLOW	M7 [0.0-0.0]	0.0	0.0	M-7
YELLOW	M8 [0.0-0.0]	0.0	0.0	M-8

Notes:

bgs = Below ground surface
Point Name designates the sample location as shown on Figure 1.

TABLE 2

NAS ALAMEDA
BACKGROUND DATA FOR BLUE AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Inorganic Chemicals (mg/kg)								
Aluminum[2]	NA	89/89	2,880	26,800	5,726	1.6	7,096	0.06
Antimony[3]	0.46-9.2	2/89	0.89	1.0	1.8	1.3	2.1	0.71
Arsenic[2]	0.61-13	34/89	0.74	23.0	2.2	2.9	4.8	1.3
Barium[1]	24-25	86/89	0.30	198	48.9	32.3	55.7	0.66
Beryllium[1]	0.2-1.3	25/89	0.09	0.77	0.32	0.21	0.36	0.67
Cadmium[1]	0.06-1.3	30/89	0.1	0.82	0.32	0.23	0.37	0.73
Calcium[2]	NA	89/89	1,360	19,200	3,044	1.9	4,185	0.08
Chromium[1]	NA	89/89	11.4	81.7	33.7	12.9	36.5	0.38
Cobalt[1]	3.9-6.8	67/89	1.9	14	5.0	2.7	5.6	0.53
Copper[2]	5.8-6.3	84/89	4.2	89.4	10.4	2.0	15.2	0.30
Iron[1]	NA	89/89	760	26,900	10,068	5,070	11,135	0.50
Lead[2]	1.4-6.8	28/89	1.3	41	3.3	2.3	5.4	0.68
Magnesium[2]	NA	89/89	1,510	42,400	2,560	1.6	3,156	0.06
Manganese[2]	NA	89/89	50	1,060	126	1.7	160.0	0.11
Nickel[2]	NA	89/89	11.6	88.5	26.9	1.5	31.9	0.13
Potassium[2]	610	88/89	310	6,382	802	1.6	998	0.07
Selenium[3]	0.39-13	1/89	5.7	5.7	2.8	2.1	3.3	0.75
Silver[3]	0.18-6.5	2/89	0.44	0.61	0.95	1.2	1.2	1.2
Sodium[2]	288-650	69/89	88.1	3,510	299.8	2.2	470.7	0.14
Thallium[3]	0.33-13	1/89	5.3	5.3	2.3	2.2	2.8	0.94
Titanium[1]	NA	66/66	223	1,020	408.4	145.8	444.3	0.36
Vanadium[1]	NA	89/89	12.8	62.3	22.5	8.9	24.3	0.39

TABLE 2 (Continued)

NAS ALAMEDA
BACKGROUND DATA FOR BLUE AREA
DATA SUMMARY

	Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
	Zinc(2)	NA	89/89	14	316	27.0	1.6	33.5	0.15
	Polycyclic Aromatic Hydrocarbons (µg/kg)								
11	Acenaphthene(3)	83-14,000	1/85	130	130	293.1	743.2	453.5	2.5
12	Anthracene(3)	83-14,000	2/85	59	390	294.2	743.5	454.7	2.5
1	Benzo(a)anthracene(4)	100-14,000	8/85	61	1,000	290.1	747.9	451.5	2.6
2	Benzo(a)pyrene(2)	140-14,000	11/85	48	1,300	208.4	1.8	277.3	0.11
3	Benzo(b)fluoranthene(2)	100-14,000	9/85	66	760	202.4	1.8	273.9	0.11
4	Benzo(g,h,i)perylene(4)	170-14,000	6/85	140	950	304.6	745.8	465.6	2.4
5	Benzo(k)fluoranthene(2)	100-14,000	6/85	100	1,100	208.1	1.8	280.9	0.11
6	Chrysene(4)	100-14,000	11/85	58	1,300	288.9	752.6	451.3	2.6
7	Dibenzo(a,h)anthracene(3)	170-14,000	1/85	230	230	296.4	742.4	456.7	2.5
8	Fluoranthene(2)	83-14,000	12/85	54	2,000	198.2	1.9	284.2	0.13
13	Fluorene(3)	83-14,000	1/85	100	100	292.7	743.3	453.2	2.5
9	Indeno(1,2,3-cd)pyrene(2)	170-14,000	6/85	120	930	215.2	1.7	279.3	0.10
14	Naphthalene(3)	83-14,000	1/85	35	35	292.3	743.5	452.8	2.5
15	Phenanthrene(2)	83-14,000	8/85	27	1,600	196.0	2.0	284.2	0.13
10	Pyrene(1)	83-14,000	12/85	65	2,500	343.4	785.3	484.6	2.3
	2-methylnaphthalene(3)	100-14,000	1/85	320	320	294.2	742.9	454.6	2.5

Notes:

(1) Data normally distributed
(2) Data lognormally distributed. Calculated coefficient of variation for natural logarithm-transformed data.
(3) Too few detections to determine distribution. Calculated coefficient of variation from arithmetic mean and standard deviation.
(4) Data are not normally or lognormally distributed. Calculated coefficient of variation from arithmetic mean and standard deviation.
NA Not applicable
mg/kg milligrams per kilogram
µg/kg micrograms per kilogram

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TABLE 3

NAS ALAMEDA
BACKGROUND DATA FOR YELLOW AREA
DATA SUMMARY

Chemical	Sample Quantitation Limits	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Inorganic Chemicals (mg/kg)								
Aluminum[1]	NA	51/51	20.0	13,300	6,156	2,532	6,869	0.41
Antimony[3]	1.3-7.3	3/51	2.8	3.6	2.9	0.69	3.1	0.24
Arsenic[1]	10-12	22/51	1.1	33	7.6	6.4	9.4	0.84
Barium[2]	21-24	44/51	19.8	260	30.4	1.9	43.5	0.18
Beryllium[1]	1-1.2	10/51	0.3	1.3	0.58	0.19	0.63	0.33
Cadmium[1]	0.36-1.2	12/51	0.33	2.9	0.66	0.49	0.80	0.74
Calcium[2]	NA	51/51	500	97,000	3,441	2.0	5,269	0.08
Chromium[4]	NA	51/51	5.0	69.7	32.1	8.4	34.4	0.26
Cobalt[1]	5-7.6	20/51	4.3	11.4	4.3	2.3	4.9	0.53
Copper[1]	5.5-5.6	49/51	4.2	49	15.9	12.0	19.3	0.76
Iron[1]	NA	51/51	10.0	20,800	10,324	3,859	11,410	0.37
Lead[2]	NA	51/51	3.3	752	22.2	2.8	51.7	0.33
Magnesium[2]	NA	51/51	500	8,820	2,541	1.6	3,178	0.06
Manganese[1]	NA	51/51	5.0	330	136.9	73.6	157.6	0.54
Mercury[1]	0.05-0.15	5/10	0.05	0.18	0.08	0.05	0.12	0.68
Nickel[4]	NA	51/51	5.0	71.1	27.8	9.8	30.6	0.35
Potassium[1]	NA	51/51	500	1,700	921	291	1,003	0.32
Silver[4]	0.18-6	6/51	0.52	30	2.9	4.1	4.0	1.4
Sodium[1]	125-610	11/51	232	1,380	353	260.8	425.9	0.74
Titanium[1]	NA	41/41	280	663	456	77.1	480.2	0.17
Vanadium[1]	NA	51/51	15.6	50.0	25.7	7.9	27.9	0.31
Zinc[1]	NA	51/51	17.0	140.0	47.8	31.9	56.8	0.67

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TABLE 3 (Continued)

NAS ALAMEDA
BACKGROUND DATA FOR YELLOW AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Polycyclic Aromatic Hydrocarbons (µg/kg)								
Benzo(a)pyrene[3]	84-,6,700	1/51	24.0	24.0	400.4	487.1	537.4	1.2
Benzo(g,h,i)perylene[3]	96-6,700	1/51	19.0	19.0	402.2	485.9	538.9	1.2
Chrysene[3]	60-6,700	2/51	22.0	180.0	398.2	488.7	535.6	1.2
Fluoranthene[3]	48-6,700	3/51	30.0	290.0	407.0	492.1	545.4	1.2
Indeno(1,2,3-cd)pyrene[3]	96-6,700	1/51	21.0	21.0	402.2	485.9	538.9	1.2
Phenanthrene[3]	48-6,700	2/51	120.0	200.0	401.9	486.7	538.8	1.2
Pyrene[3]	48-6,700	4/51	33.0	900.0	411.1	492.8	549.7	1.2

Notes:

(1) Data normally distributed
(2) Data lognormally distributed. Calculated coefficient of variation for natural logarithm-transformed data.
(3) Too few detections to determine distribution
(4) Data are not normally or lognormally distributed
NA Not applicable
mg/kg milligrams per kilogram
µg/kg micrograms per kilogram

TABLE 4

NAS ALAMEDA
BACKGROUND DATA FOR PINK AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Inorganic Chemicals (mg/kg)								
Aluminum[2]	NA	56/56	1,700	22,600	5304.7	1.6	6,657.7	0.05
Antimony[1]	.0.46-11.0	19/56	0.7	8.6	2.3	1.9	2.8	0.83
Arsenic[2]	0.59-10.0	46/56	0.44	15.6	1.8	2.3	3.2	1.4
Barium[2]	NA	56/56	6.9	156.0	36.6	1.7	48.7	0.15
Beryllium[1]	0.15-1.0	29/56	0.25	2.3	0.53	0.43	0.64	0.81
Cadmium[2]	0.08-1.0	11/56	0.1	3.2	0.18	2.7	0.42	0.58
Calcium[2]	NA	56/56	816.0	66,600.0	2,962.6	2.1	4,785.2	0.09
Chromium[1]	NA	56/56	12.3	66.7	30.1	10.1	32.8	0.34
Cobalt[4]	3.96-5.7	49/56	3.0	62.1	7.1	10.0	9.8	1.4
Copper[2]	8.8-10.2	53/56	3.1	49.1	7.6	1.8	10.5	0.29
Iron[2]	NA	56/56	4,500.0	27,900.0	9,543.0	1.5	11,604.9	0.05
Lead[2]	1.9-3.0	52/56	0.47	165.0	4.3	2.9	10.4	0.73
Magnesium[2]	NA	56/56	1,290.0	8,800.0	2,646.9	1.5	3,195.9	0.05
Manganese[2]	NA	56/56	55.5	885.0	130.6	1.8	181.7	0.12
Mercury[2]	0.06-0.269	8/56	0.057	2.71	0.064	2.4	0.12	0.32
Nickel[2]	NA	56/56	11.5	180.4	25.6	1.4	29.9	0.10
Potassium[2]	NA	56/56	209.0	2,480.0	696.3	1.5	847.9	0.07
Silver[2]	0.18-1.47	12/56	0.32	5.6	0.32	2.5	0.63	0.80
Sodium[2]	NA	56/56	62.6	1,580.0	337.3	1.9	503.1	0.11
Thallium[4]	0.11-10.0	1/56	0.53	0.53	0.25	0.65	0.43	0.34
Titanium[3]	NA	1/1	518.0	518.0	518.0	NA	NA	NA
Vanadium[1]	NA	56/56	10.5	55.3	22.9	9.2	25.4	0.40

044-0316irrira/alameda/tb2-pnk.doc/2/7/97/jem

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TABLE 4 (Continued)

NAS ALAMEDA
BACKGROUND DATA FOR PINK AREA
DATA SUMMARY

	Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
	Zinc[2]	18.0	55/56	10.0	191.0	23.2	1.7	30.8	0.17
	Polycyclic Aromatic Hydrocarbons (:g/kg)								
10	Acenaphthene[3]	70-3,400	1/56	150.0	150.0	121.6	226.2	182.3	1.9
11	Anthracene[3]	70-3,400	1/56	240.0	240.0	123.2	226.8	184.1	1.8
1	Benzo(a)anthracene[3]	100-3,400	1/56	1,600.0	1,600.0	497.1	2,264.3	1,105.0	4.6
2	Benzo(a)pyrene[3]	140-3,400	1/56	2,600.0	2,600.0	186.4	394.9	292.4	2.1
3	Benzo(b)fluoranthene[3]	100-3,400	1/56	2,300.0	2,300.0	168.1	366.1	266.4	2.2
4	Benzo(g,h,i)perylene[3]	160-3,400	1/56	1,700.0	1,700.0	177.1	300.4	257.7	1.7
5	Benzo(k)fluoranthene[3]	100-3,400	1/56	620.0	620.0	138.1	232.9	200.6	1.7
6	Chrysene[3]	100-3,400	1/56	1,500.0	1,500.0	153.8	288.9	231.4	1.9
7	Fluoranthene[3]	70-3,400	3/56	34.0	3,600.0	207.5	477.0	355.6	2.3
8	Indeno(1,2,3-cd)pyrene[3]	160-3,400	1/56	1,800.00	1,800.00	178.8	309.8	262.0	1.7
12	Naphthalene[3]	70-3,400	1/56	99.0	99.0	120.7	226.2	181.4	1.9
13	Phenanthrene[3]	70-3,400	2/56	240.0	2,200.0	131.3	291.1	209.4	2.2
9	Pyrene[3]	70-3,400	3/56	210.0	6,100.0	240.5	831.0	463.5	3.5

Notes:

(1)	Data normally distributed
(2)	Data lognormally distributed. Calculated coefficient of variation for natural logarithm-transformed data.
(3)	Too few detections to determine distribution. Calculated coefficient of variation from arithmetic mean and standard deviation.
(4)	Data are not normally or lognormally distributed. Calculated coefficient of variation from arithmetic mean and standard deviation.
NA	Not applicable
mg/kg	milligrams per kilogram
µg/kg	micrograms per kilogram

TABLE 5
NAS ALAMEDA
AMBIENT CONCENTRATIONS OF METALS IN SHALLOW GROUNDWATER

Inorganic Chemical	Reported Detection Limit (ug/L)	Frequency of Detection	Minimum Detected Concentration (ug/L)	Maximum Detected Concentration (ug/L)	Mean Concentration (ug/L)	95 UCL Concentration (ug/L)	80 LCL/95 Concentration (ug/L)	MCL (ug/L)
Aluminum	8.4-223	51/176	3	3970	32.12	96.2	439.13	1000
Antimony	2-37.5	12/176	2.5	47.8	5.83	11.8	45.77	6
Arsenic	1.9-100	94/179	2	40.7	4.54	8	28.39	50
Barium	4.3-55.4	144/176	2.3	1260	34.06	123.3	574.73	1000
Beryllium	0.1-3.7	18/176	0.94	3	0.49	1	3.83	4
Cadmium	0.2-8.0	16/176	0.32	6.5	0.53	1.3	5.38	5
Calcium	898-1370	176/180	620	513000	17865	78223	379269	NA
Hexavalent Chromium-n	100	1/3	4	4	34.7	100.6	NA	NA
Chromium	0.6-32	23/176	0.74	82.8	1.54	3.4	13.79	50
Cobalt	2.3-17.2	6/176	2.5	10.5	3.5	4.6	11.57	NA
Copper	0.4-69.7	54/176	2.1	27.3	3.97	7.5	27.48	1000
Iron	4.8-363	119/180	7.2	24400	108.58	1624	7135	300
Lead	0.8-20	18/180	1.2	28.4	0.91	1.3	3.88	NA
Magnesium	NA	180/180	549	1070000	15092	103358	500168	NA
Manganese	1.1-12.3	172/180	1.1	2480	86.01	1171	5213	50
Mercury-n	0.1-0.29	3/180	0.2	0.3	0.1	0.1	0.15	2
Molybdenum	2.0-25.4	5/100	3.1	19.4	4.59	5.6	11.52	NA
Nickel	1.7-49.1	13/180	2.7	151	5.6	7.4	19.06	100
Potassium	763-2340	175/180	1200	505000	14314	40552	182153	NA
Selenium-n	1.9-54	1/180	2.5	2.5	1.58	1.9	5.97	50
Silver-n	0.4-5.4	2/170	2.4	4.8	1.48	1.6	3.33	100
Sodium	NA	180/180	4600	8160000	198988	937369	4539829	NA
Thallium-n	1.7-76	3/175	3.6	5.2	2.21	2.3	5.8	2
Vanadium	1.4-19.5	69/180	2	50.8	4.97	8.4	28.65	NA
Zinc	0.5-32.8	55/180	2.8	46800	4.87	10.5	42.91	5000

Notes:

MCL = Maximum contaminant level
NA = Not available
NC = Not calculated
ug/L = microgram per liter
80 LCL/95 = 80th lower confidence limit on the 95th percentile of the distribution
95 UCL = 95th upper confidence limit

[1] The statistics for chemicals denoted with an "-n" are based on a normal distribution; too few detections were available to determine probability distribution.

[2] Groundwater MCLs required to support municipal supply are based on the Water Quality Control Plan, San Francisco Bay Basin, Region 2 (RWQCB 1995)

FIGURES

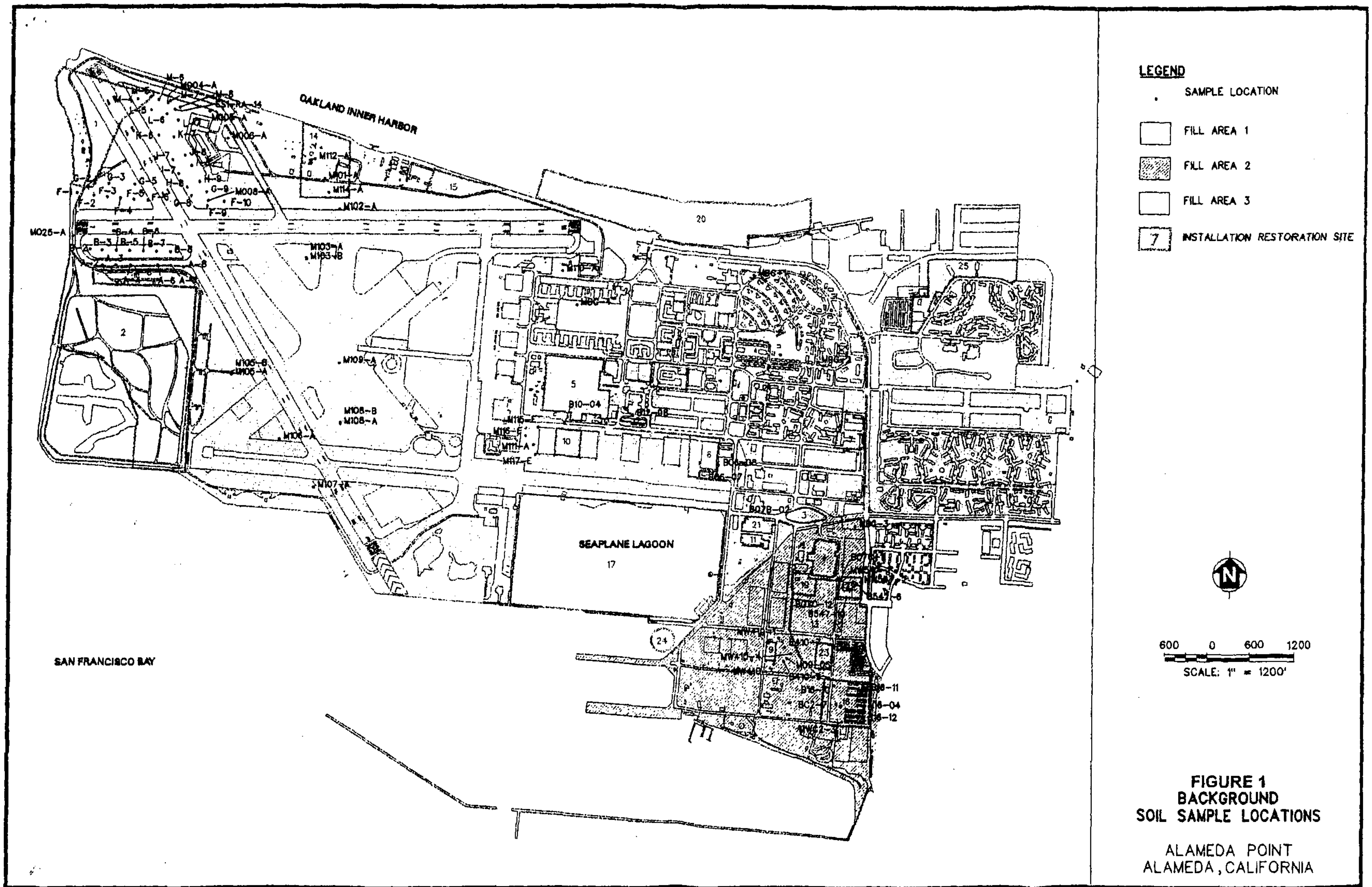

FIGURE 1
BACKGROUND
SOIL SAMPLE LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA

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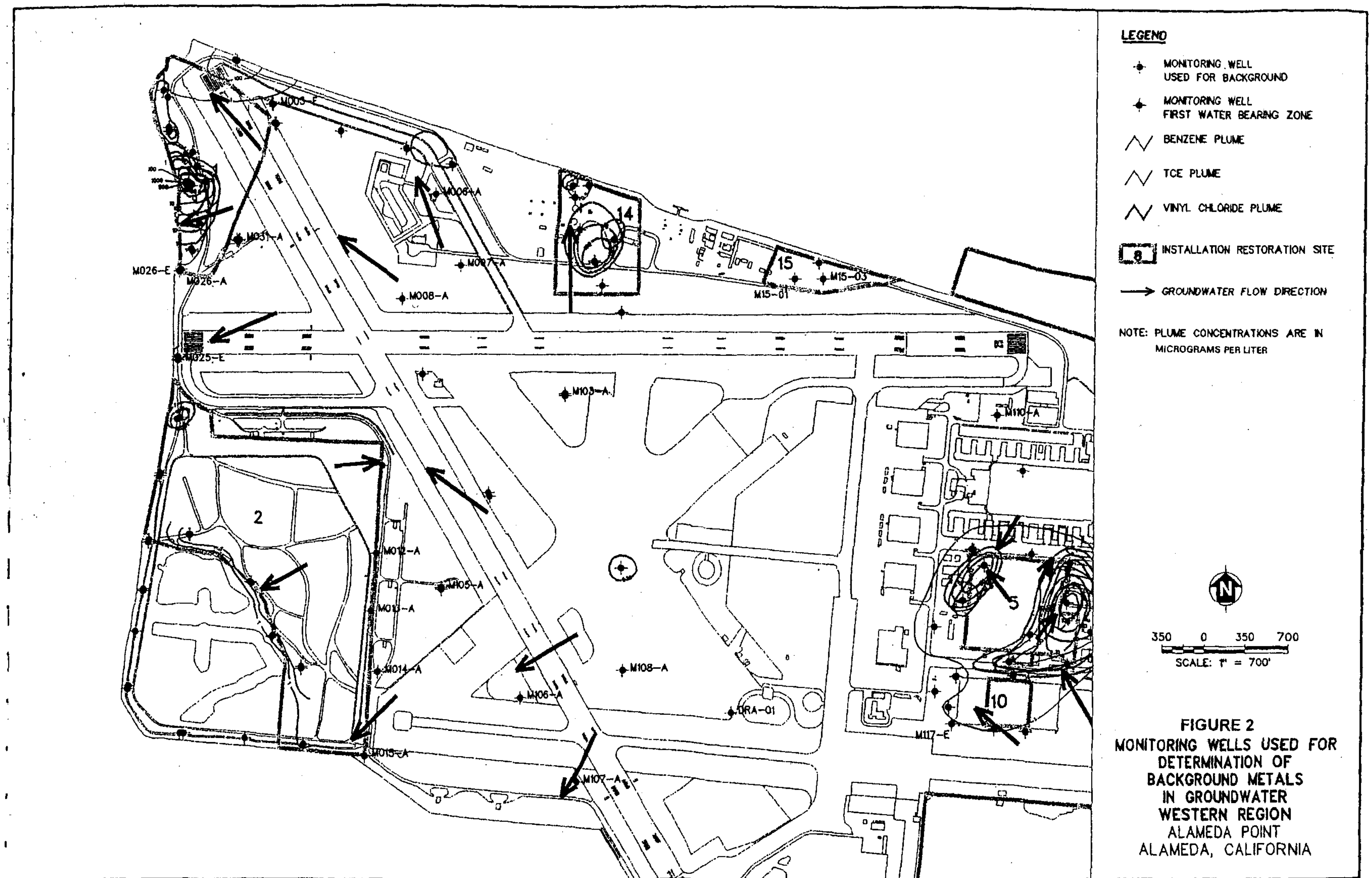

FIGURE 2
MONITORING WELLS USED FOR DETERMINATION OF BACKGROUND METALS IN GROUNDWATER WESTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

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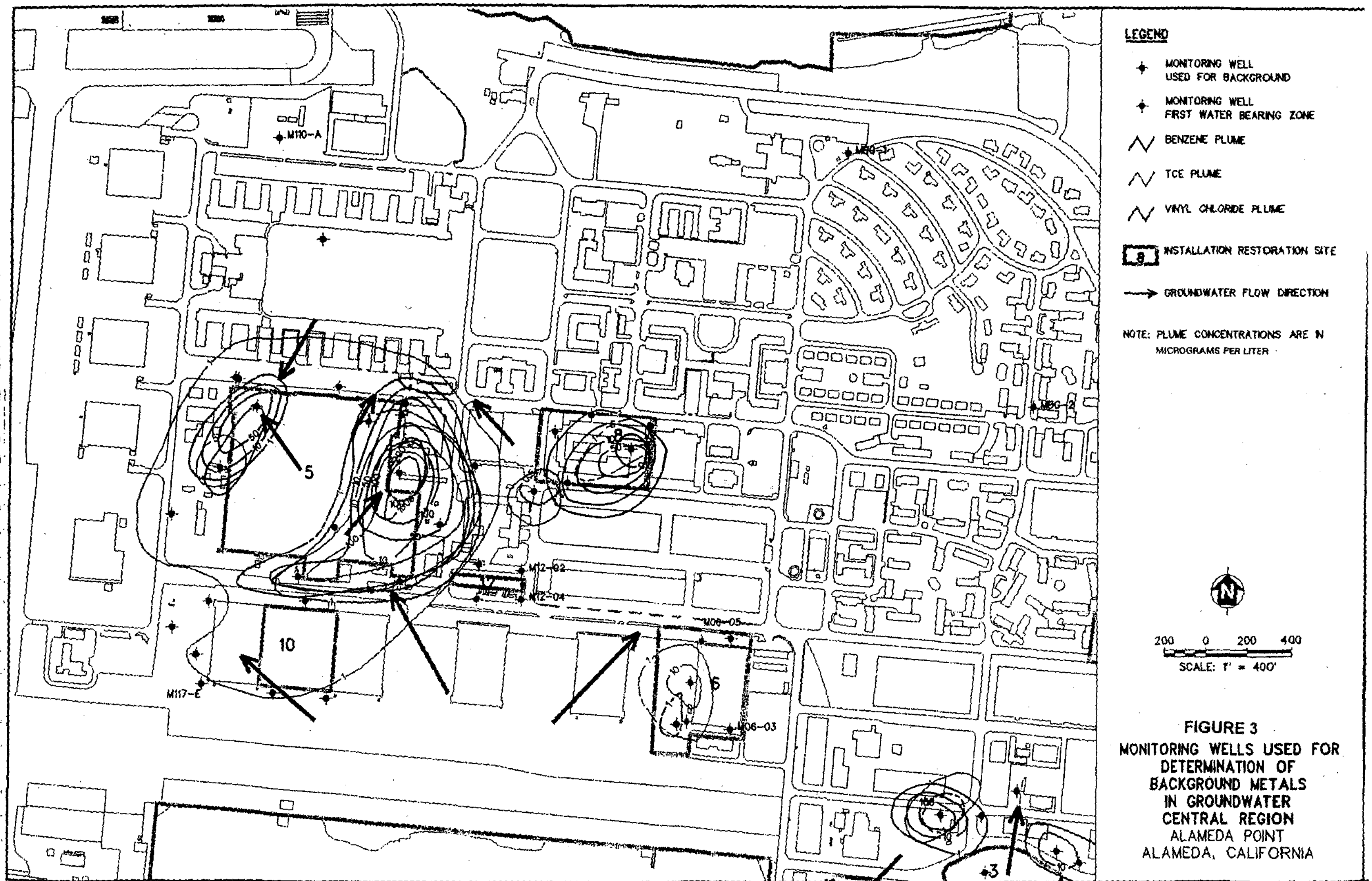

FIGURE 3
MONITORING WELLS USED FOR DETERMINATION OF BACKGROUND METALS IN GROUNDWATER CENTRAL REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

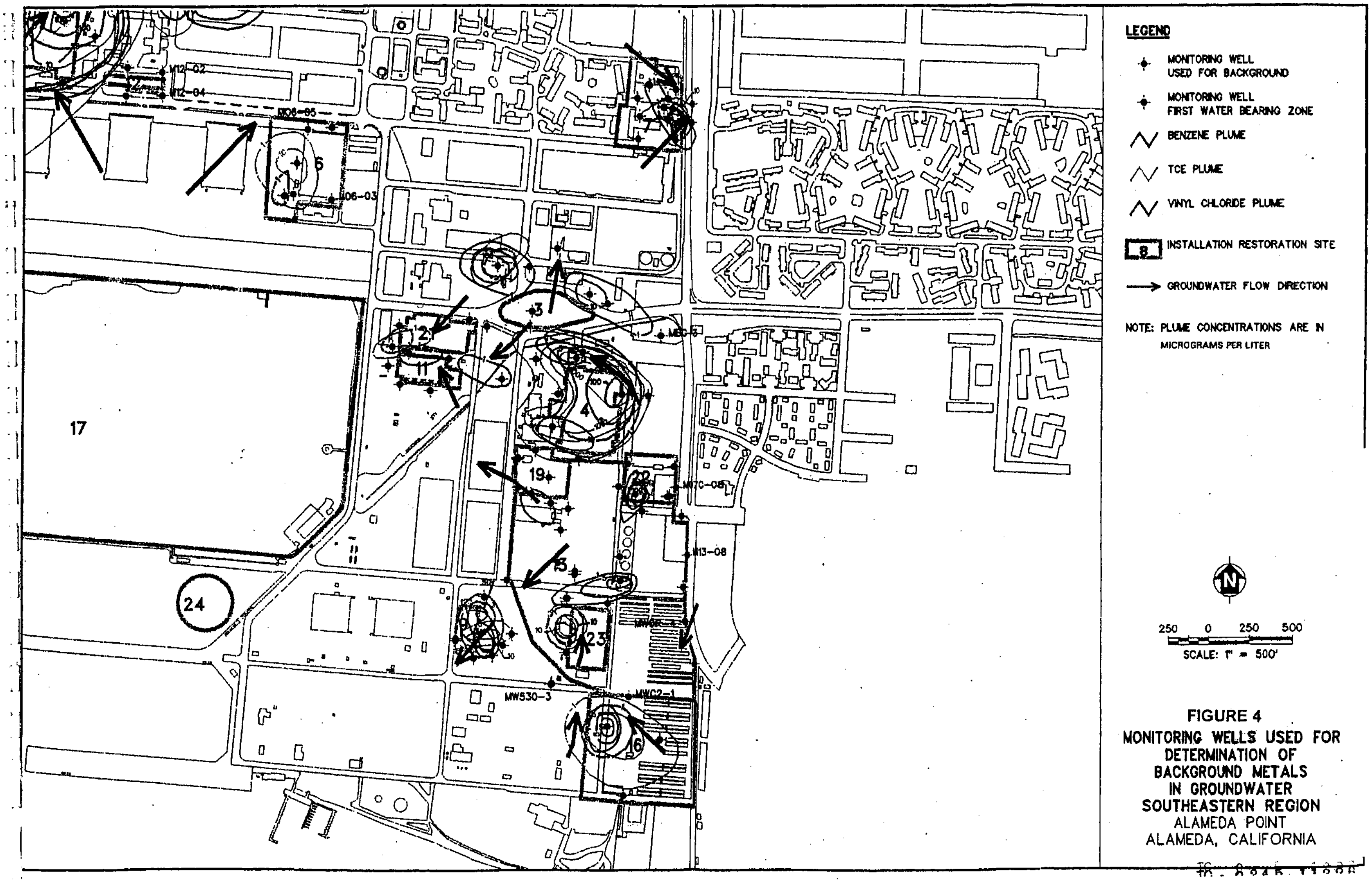

FIGURE 4
MONITORING WELLS USED FOR DETERMINATION OF BACKGROUND METALS IN GROUNDWATER SOUTHEASTERN REGION
ALAMEDA POINT
ALAMEDA, CALIFORNIA

TABLE 3.1: SUMMARY OF DESCRIPTIVE STATISTICS FOR BACKGROUND SOIL - BLUE DATA SET

Appendix C, HHRA for IWTP 360, Alameda Point, Alameda, CA

Analyte Group	Chemical	Distribution[a]	SUMMARY STATISTICS												
			Sample Size		Detection Frequency (Percent)	Censored Data		Detected Data		Detected & Censored Data					
			Detected	Total		Min	Max	Min	Max	Median[b]	Q95[b]	Mean[c]	SD[c]	CV	UCL_{95}[d]
Total Metals	Aluminum	Unknown[b]	88	88	100	N/A	N/A	2,880.00	26,800.00	4,965.00	16,000.00	6,417.49	352.02	0.05	7,073.70
	Antimony	Not Tested	2	88	2	0.46	9.20	0.89	1.00	2.40	7.71	2.16	0.39	0.18	2.90
	Arsenic	Not Tested	33	88	38	0.61	13.00	0.74	23.00	2.90	16.55	4.59	0.95	0.21	6.39
	Barium	Unknown[b]	85	88	97	24.00	25.00	0.30	198.00	38.75	114.60	53.01	5.04	0.10	63.26
	Beryllium	Not Tested	25	88	28	0.20	1.30	0.09	0.77	0.30	1.20	0.37	0.06	0.15	0.49
	Cadmium	Not Tested	29	88	33	0.06	1.30	0.10	0.82	0.30	1.20	0.40	0.08	0.19	0.49
	Calcium	Unknown[b]	88	88	100	N/A	N/A	1,360.00	19,200.00	2,600.00	14,165.00	3,683.74	267.39	0.07	4,201.93
	Chromium	Unknown[b]	88	88	100	N/A	N/A	11.40	81.70	29.50	64.26	33.50	1.25	0.04	35.74
	Cobalt	Lognormal	66	88	75	3.94	6.80	1.90	14.00	5.35	12.04	5.37	0.45	0.08	6.45
	Copper	Unknown[b]	83	88	94	5.80	6.30	4.20	89.40	9.70	40.35	13.12	1.07	0.08	15.23
	Iron	Unknown[b]	88	88	100	N/A	N/A	760.00	26,900.00	8,140.00	20,995.00	10,072.09	548.13	0.05	11,092.99
	Lead	Not Tested	27	88	31	1.40	6.80	1.30	41.00	5.90	13.01	5.31	0.88	0.17	7.54
	Magnesium	Unknown[b]	88	88	100	N/A	N/A	1,510.00	42,400.00	2,240.00	6,503.00	2,867.67	154.94	0.05	3,156.01
	Manganese	Unknown[b]	88	88	100	N/A	N/A	50.00	1,060.00	108.50	340.75	143.63	8.45	0.06	159.52
	Mercury	Not Tested	0	22	0	0.07	0.18	N/A	N/A	0.17	0.18	N/A	N/A	N/A	N/A
	Molybdenum	Not Tested	0	85	0	0.31	6.50	N/A	N/A	1.40	6.20	N/A	N/A	N/A	N/A
	Nickel	Unknown[b]	88	88	100	N/A	N/A	11.60	88.50	23.80	64.13	29.17	1.35	0.05	31.64
	Potassium	Unknown[b]	87	88	99	610.00	610.00	310.00	6,382.00	769.50	2,310.00	902.98	50.21	0.06	996.73
	Selenium	Not Tested	1	88	1	0.43	13.00	5.70	5.70	5.00	12.00	4.05	0.97	0.24	4.67
	Silver	Not Tested	2	88	2	0.18	6.50	0.44	0.61	0.70	6.20	1.07	0.27	0.25	1.88
	Sodium	Unknown[b]	68	88	77	288.00	650.00	88.10	3,510.00	340.00	1,544.50	422.62	47.51	0.11	718.20
	Thallium	Not Tested	1	88	1	0.36	13.00	5.30	5.30	3.10	12.00	3.20	0.83	0.26	4.16
	Titanium	Lognormal	66	66	100	N/A	N/A	223.00	1,020.00	372.50	701.20	407.10	16.33	0.04	436.76
	Vanadium	Unknown[b]	88	88	100	N/A	N/A	12.80	62.30	20.00	41.78	22.23	0.81	0.04	23.68
	Zinc	Unknown[b]	88	88	100	N/A	N/A	14.00	84.00	24.85	65.38	28.55	1.30	0.05	30.93

Notes:

Concentration units are mg/kg.
For samples with less than 15 percent censored data, one half the reporting limit is substituted for each non-detect measurement in all calculations.
For higher frequencies of censored data, all calculations were performed using stochastic modeling, following the "bounding" approach from EPA (2002), as described below under notes c and d.
No calculations of the mean, SD, CV, or UCL95 are peformed for sample sizes less than 3 or detection frequencies of zero.

a For all cases with at least 5 detected samples and a detection frequency greater than or equal to 50 percent, tested using the Shapiro-Wilk W test (alpha equal to 0.05).
Distributions confirmed as normal or lognormal are listed as "Normal" or "Lognormal." For cases where distribution testing was not conducted, the distribution is listed as "Not Tested."
For cases in which distributions could not be confirmed using the Shipiro-Wilk W test, distributions were estimated using probability plots, box plots, and frequency histograms.
Distributions estimated to be normal or lognormal are listed as Unknown[a] or Unknown[b], respectively.

b Estimated for all samples using a nonparametric approach, based on rank ordering of the data (reported values used for all censored data).

c For all samples with at least one detection, calculated using distribution-dependent formulae.
For confirmed or estimated normal distributions with fewer than 15 percent censored data, calculated using equations 4.3 (mean) and 4.4 (standard deviation) in Gilbert (1987).
For confirmed or estimated lognormal distributions with fewer than 15 percent censored data, these are the minimum variance unbiased (MVU) estimators, following equations 13.3 (mean) and 13.5 (standard deviation) in Gilbert (1987).
All other calculations use the median values generated from 2,000 iterations of a Monte Carlo model, following the "bounding" approach described in EPA (2002) [see conceptual model in Figure X-X and text in methods section for more details].

d For confirmed or estimated normal distributions with fewer than 15 percent censored data, calculated using equation 11.6 in Gilbert (1987).
For confirmed or estimated lognormal distributions with fewer than 15 percent censored data, calculated using Land's method (EPA 1992, Gilbert 1987).
Calculations for all cases with greater than 15 percent censored data use the 95th percentile generated from 2,000 iterations of a Monte Carlo model, following the "bounding" approach described in EPA (2002) [see conceptual model in Figure X-X and text in methods section for more details]. Calculations are based on either normal or lognormal (nonparametric Chebyshev inequality) model equations.

CV Coefficient of variation (SD/mean)

Min Minimum concentration reported

TABLE 3.1: SUMMARY OF DESCRIPTIVE STATISTICS FOR BACKGROUND SOIL - BLUE DATA SET

Appendix C, HHRA for IWTP 360, Alameda Point, Alameda, CA

Max	Maximum concentration reported
N/A	Not applicable
Q95	95th percentile (quantile)
SD	Standard deviation
UCL_{95}	The one-sided 95 percent upper confidence limit of the mean
Unknown[	Distribution assumed to be normal based on examination of probability plots and outlier box plots
Unknown[	Distribution assumed to be lognormal based on examination of probability plots and outlier box plots

References

Gilbert, R. O. 1987. *Statistical Methods for Environmental Pollution Monitoring*. John Wiley & Sons, Inc., New York, NY.

U.S. Environmental Protection Agency (EPA). 1992. "Supplemental Guidance to RAGS: Calculating the Concentration Term". Intermittent Bulletin, Volume 1, Number 1. Publication 9285.7-081.

EPA. 2002. "Calculating Exposure Point Concentrations at Hazardous Waste Sites." OSWER 9285.6-10. Washington, D.C. December.

TABLE 3.2: EXPOSURE POINT CONCENTRATION SUMMARY, REASONABLE MAXIMUM EXPOSURE, AMBIENT GROUNDWATE

Appendix C, HHRA for IWTP 360, Alameda Point, Alameda, California

Scenario Timeframe:	Residential
Medium:	Ambient Groundwater
Exposure Medium:	Groundwater

Exposure Point	Chemical	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)		Exposure Point Concentration			
							Value	Units	Statistic	Rationale[a]
Ambient Groundwater	Aluminum	MG/L	1.15E-01	4.02E-01	4.53E+00		4.02E-01	MG/L	95% UCL- NP	(5)
	Antimony	MG/L	1.17E-02	1.23E-02	4.78E-02		1.23E-02	MG/L	95% UCL- NP	(5)
	Arsenic	MG/L	8.14E-03	9.88E-03	4.07E-02		9.88E-03	MG/L	95% UCL- NP	(4)
	Barium	MG/L	1.35E-01	1.85E-01	1.26E+00		1.85E-01	MG/L	95% UCL- NP	(4)
	Beryllium	MG/L	9.53E-04	9.22E-04	3.00E-03	J	9.22E-04	MG/L	95% UCL- NP	(5)
	Cadmium	MG/L	1.09E-03	1.29E-03	3.40E-03	J	1.29E-03	MG/L	95% UCL- NP	(5)
	Chromium (3+)	MG/L	3.53E-03	5.61E-03	8.28E-02		5.61E-03	MG/L	95% UCL- NP	(5)
	Chromium VI	MG/L	1.65E-02	9.17E-02	4.00E-03		4.00E-03	MG/L	MAX	(5)
	Cobalt	MG/L	5.24E-03	5.46E-03	1.05E-02	J	5.46E-03	MG/L	95% UCL- NP	(5)
	Copper	MG/L	8.09E-03	8.71E-03	2.73E-02		8.71E-03	MG/L	95% UCL- NP	(5)
	Lead	MG/L	1.35E-03	2.39E-03	2.84E-02		2.39E-03	MG/L	95% UCL- NP	(5)
	Manganese	MG/L	8.07E-01	1.37E+00	2.48E+00		1.37E+00	MG/L	95% UCL- O(T)	(2)
	Mercury	MG/L	1.18E-04	1.27E-04	6.40E-04		1.27E-04	MG/L	95% UCL- NP	(5)
	Molybdenum	MG/L	5.97E-03	6.41E-03	1.94E-02	J	6.41E-03	MG/L	95% UCL- NP	(5)
	Nickel	MG/L	8.25E-03	1.27E-02	1.51E-01		1.27E-02	MG/L	95% UCL- NP	(5)
	Selenium	MG/L	1.70E-03	2.90E-03	2.50E-03	J	2.50E-03	MG/L	MAX	(5)
	Silver	MG/L	1.80E-03	1.92E-03	4.80E-03		1.92E-03	MG/L	95% UCL- NP	(5)
	Thallium	MG/L	2.21E-03	4.06E-03	5.20E-03	J	4.06E-03	MG/L	95% UCL- NP	(5)
	Vanadium	MG/L	9.41E-03	1.03E-02	5.08E-02	J	1.03E-02	MG/L	95% UCL- NP	(5)
	Zinc	MG/L	1.38E-02	1.28E+00	4.68E+01	J	1.28E+00	MG/L	95% UCL- NP	(5)

Notes:

See Appendix X for a description of the statistical methods used.

a The lesser of the 95% UCL and maximum detected concentration was used as the exposure point concentration (EPC).

For chemicals detected in at least 85% of the samples censored data were replaced with one-half of the reported concentration. For detection frequencies less than 85% censored measurements were treated as random variables that could assume any value between zero and the reported concentration (see note under NP).

95% UCL	One-sided 95 percent upper confidence limit of the mean
ft bgs	Feet below ground surface
J	Estimated value
MAX	Maximum detected concentration
MG/L	Milligram per liter
MVUE	Minimum variance unbiased estimator
N	Normal distribution confirmed using the Shapiro-Wilk W test (alpha= 0.05).
N/A	Not applicable (not calculated)
NP	Non-parametric method*. Calculations based on stochastic modeling following the "bounding" approach in EPA (2002). 2,000 iterations of a Monte Carlo model performed for each estimate. For confirmed or assumed lognormal distributions and distributions listed as NT, the 95% UCL was determined using the nonparametric Chebyshev inequality. Fo normal distributions the 95% UCL was calculated using the t statistic. For all distributions, the 95th percentile value from the distribution of 2,000

TABLE 3.2: EXPOSURE POINT CONCENTRATION SUMMARY, REASONABLE MAXIMUM EXPOSURE, AMBIENT GROUNDWATEI

Appendix C, HHRA for IWTP 360, Alameda Point, Alameda, California

Scenario Timeframe:	Residential
Medium:	Ambient Groundwater
Exposure Medium:	Groundwater

Exposure Point	Chemical	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale[a]

calculations was used as the final estimate for the 95% UCL.

Censored (non-detected) data were treated as random variables that could assume any value between zero and the reported concentration.

*This is not a nonparametric approach in cases where the UCL is calculated using the t statistic, but NP is used for consistency with the nomenclature used in the RAGS guidelines for preparing summary tables for exposure point concentrations.

NT Distribution was not tested if the sample size was less than five or the frequency of detection was less than 50 percent. Distribution defaults to nonparametric.

O(N) Other distribution (unknown); assumed to be normal based on examination of probability plots, box plots, and frequency histograms.

O(T) Other distribution (unknown); assumed to be lognormal based on examination of probability plots, box plots, and frequency histograms.

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T Transformed (lognormal) distribution confirmed using the Shapiro-Wilk W test (alpha= 0.05).

(1) Detection frequency greater than or equal to 85%, distribution confirmed or assumed normal. 95% UCL calculated using the t statistic

(2) Detection frequency greater than or equal to 85%, distribution confirmed or assumed lognormal. 95% UCL calculated using Land's method

(3) Detection frequency between 50 and 85 percent, distribution confirmed or assumed normal. 95% UCL estimated using the bounding approach from EPA (2002).

(4) Detection frequency between 50 and 85 percent, distribution confirmed or assumed lognormal. 95% UCL estimated using the bounding approach from EPA (2002).

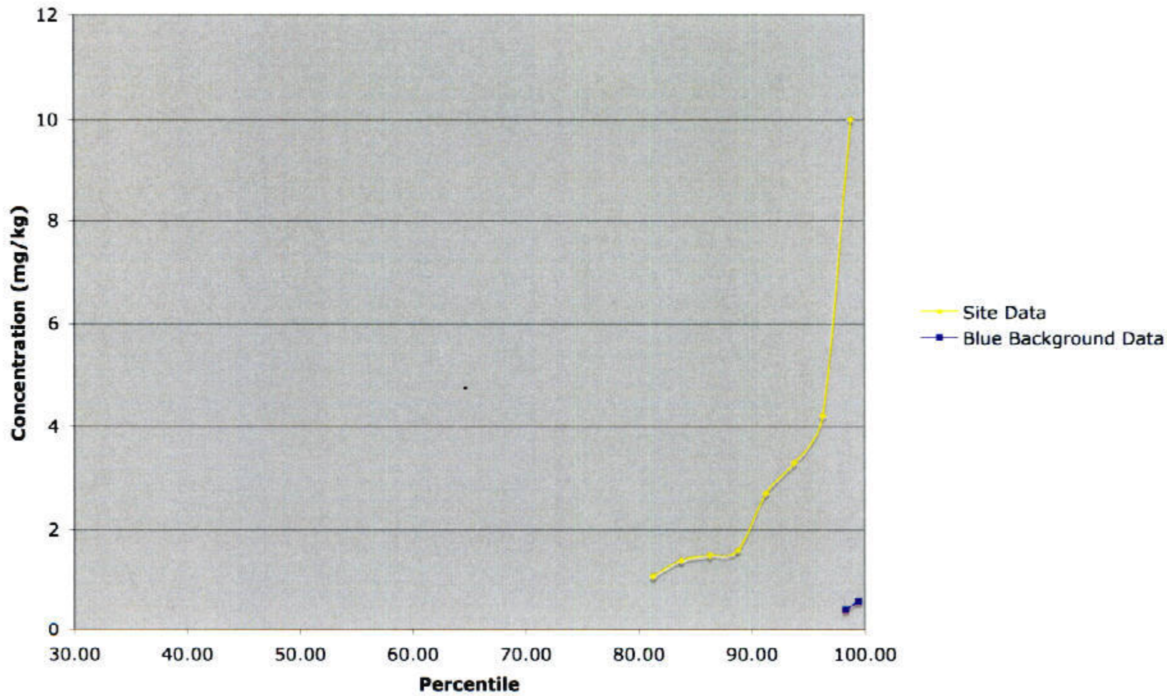
(5) Detection frequency less than 50%, distribution not tested. 95% UCL estimated using the bounding approach from EPA (2002).

Gilbert, R. O. 1987. *Statistical Methods for Environmental Pollution Monitoring*. John Wiley & Sons, Inc., New York, NY.

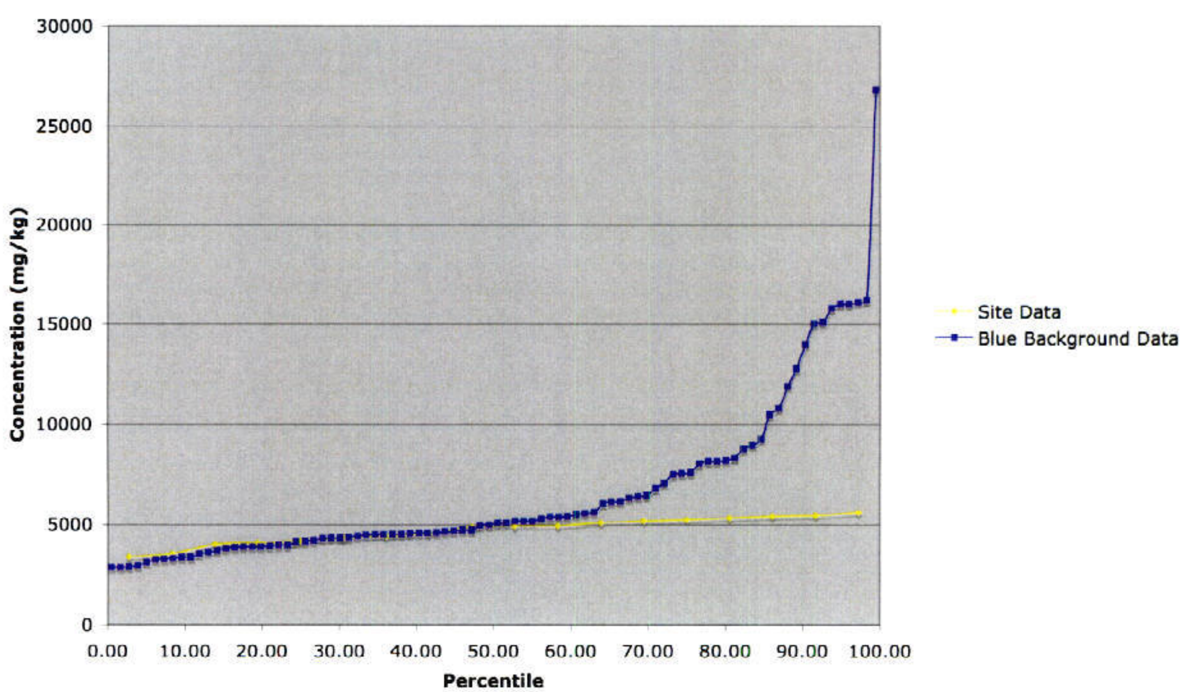
U.S. Environmental Protection Agency (EPA). 2002. "Calculating Exposure Point Concentrations at Hazardous Waste Sites." OSWER 9285.6-10. Washington, D.C. December.

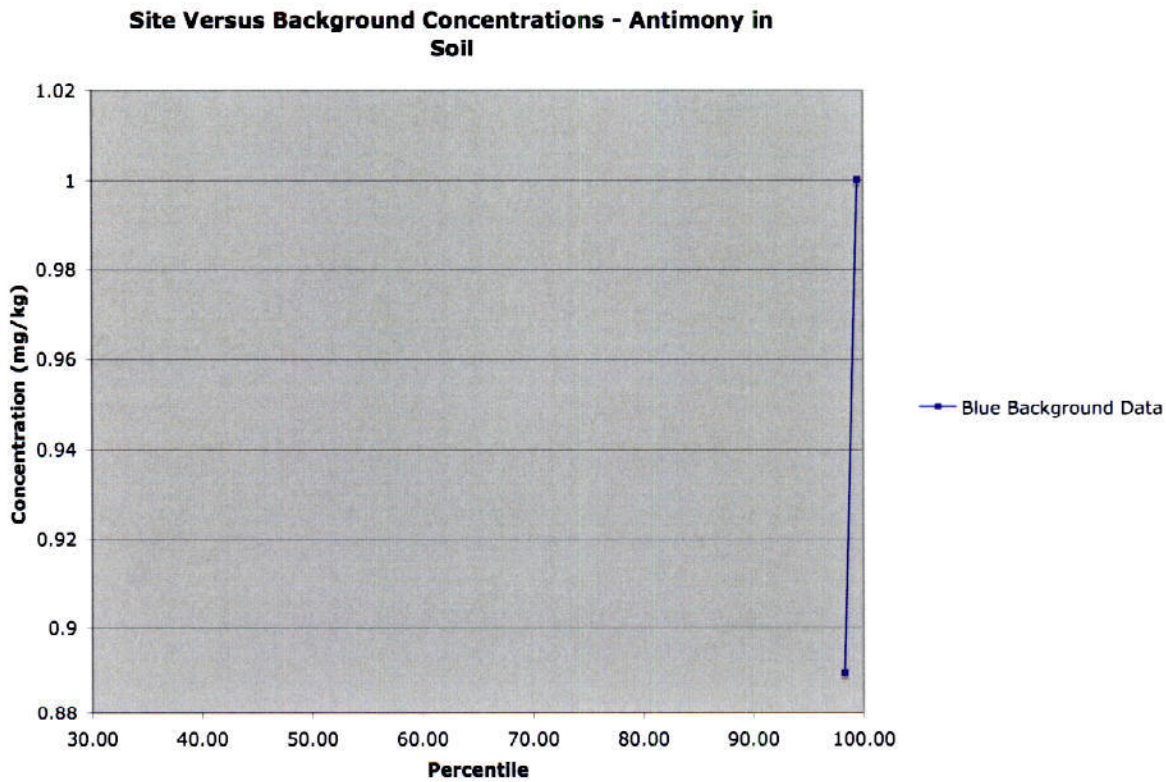
Attachment 2. Copies of Quantile Plots for Soil and Groundwater

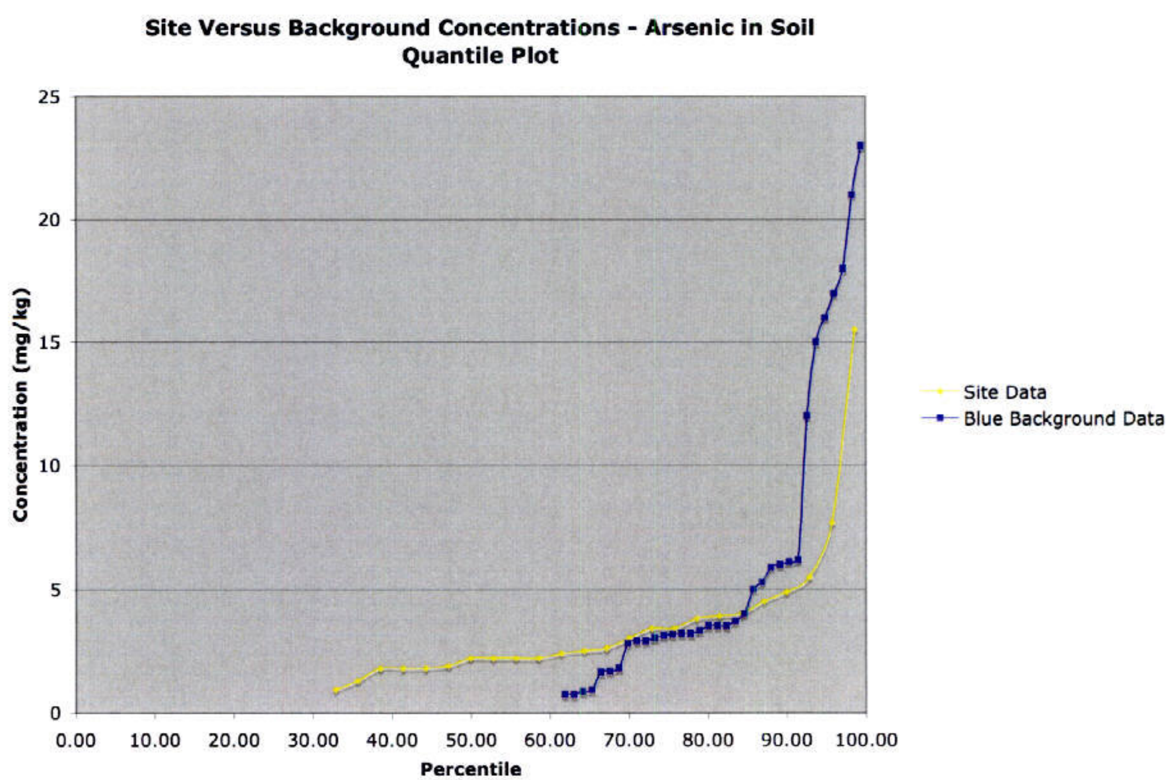
Site Versus Background Concentrations - Silver in Soil
Quantile Plot



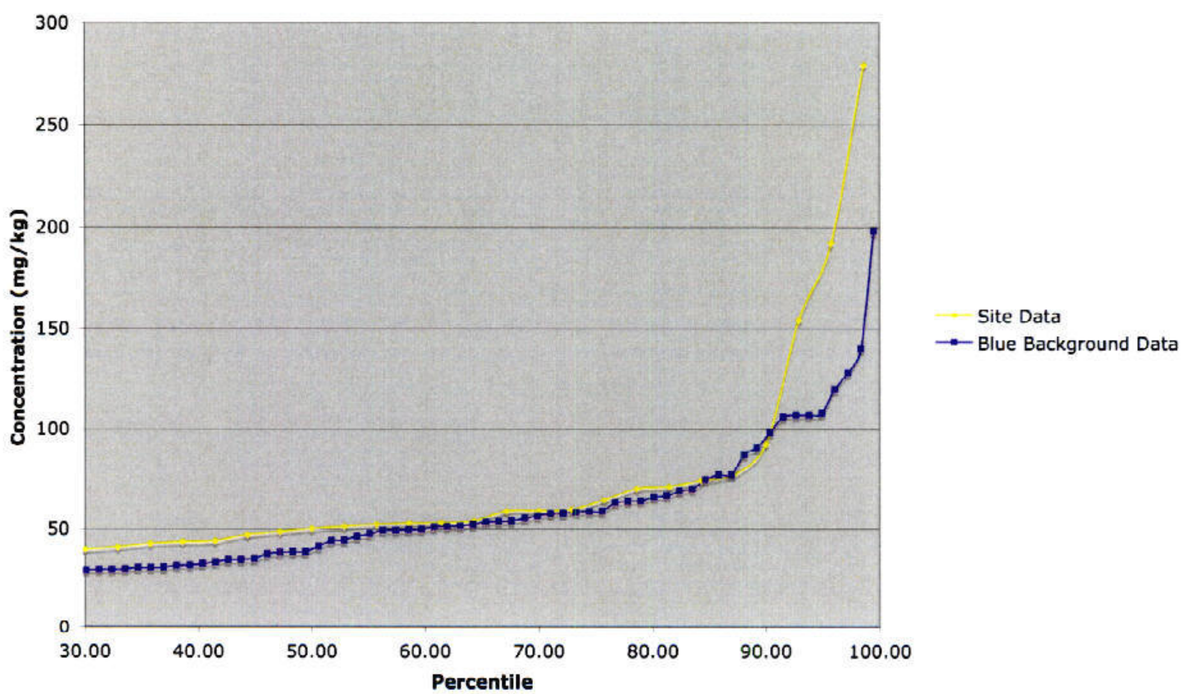
Site Versus Background Concentrations - Aluminum in Soil
Quantile Plot



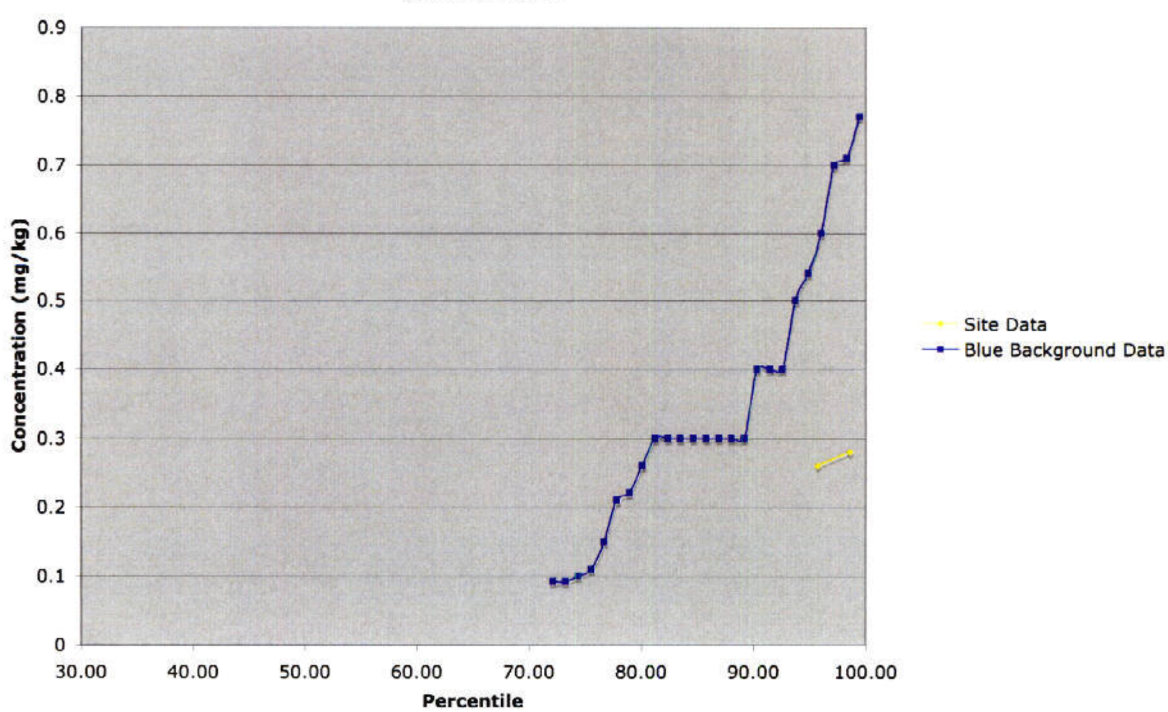

Site Versus Background Concentrations - Antimony in Soil
Concentration (mg/kg)
1.02
1
0.98
0.96
0.94
0.92
0.9
0.88
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Blue Background Data

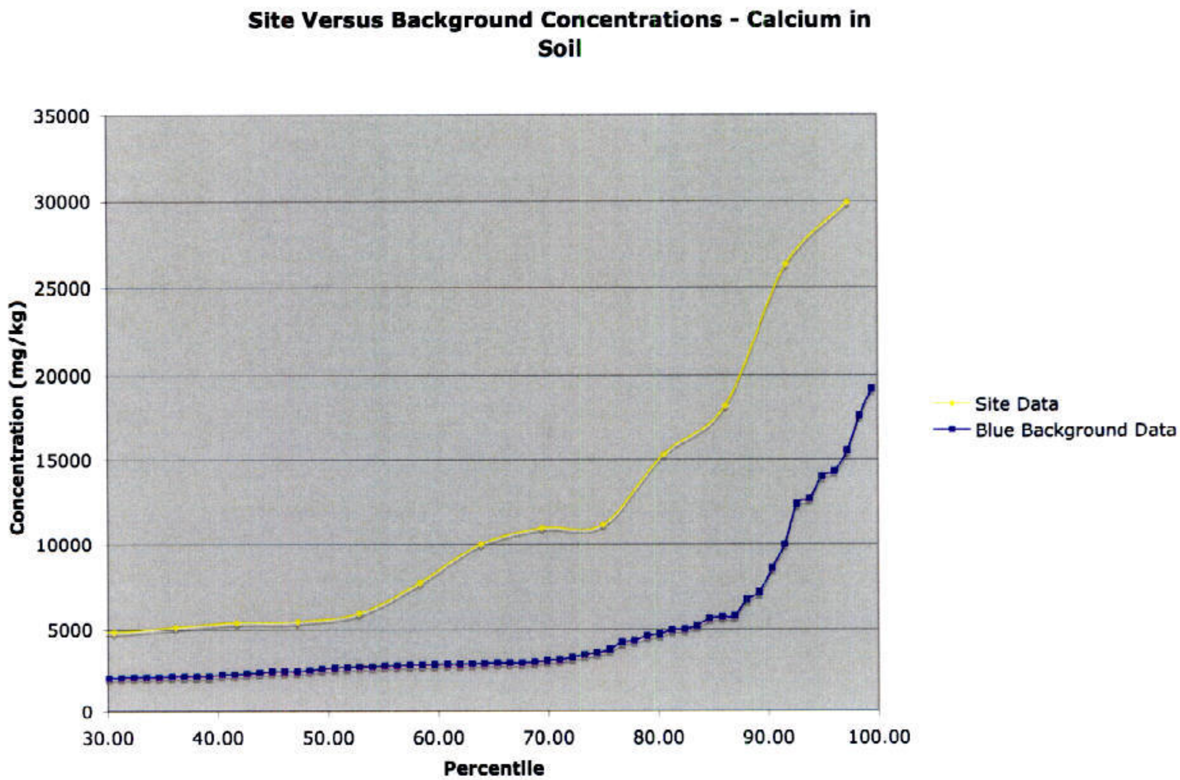

Site Versus Background Concentrations - Arsenic in Soil Quantile Plot
Concentration (mg/kg)
25
20
15
10
5
0
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Site Data
Blue Background Data

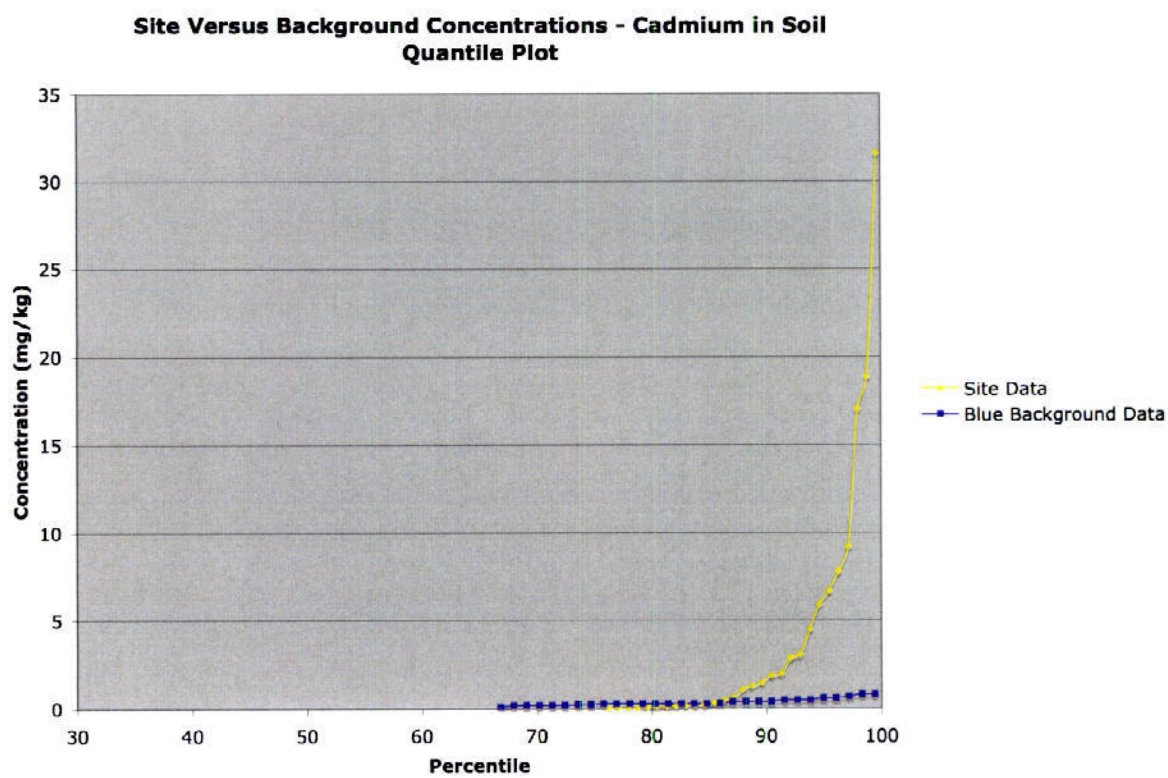
Site Versus Background Concentrations - Barium in Soil
Quantile Plot



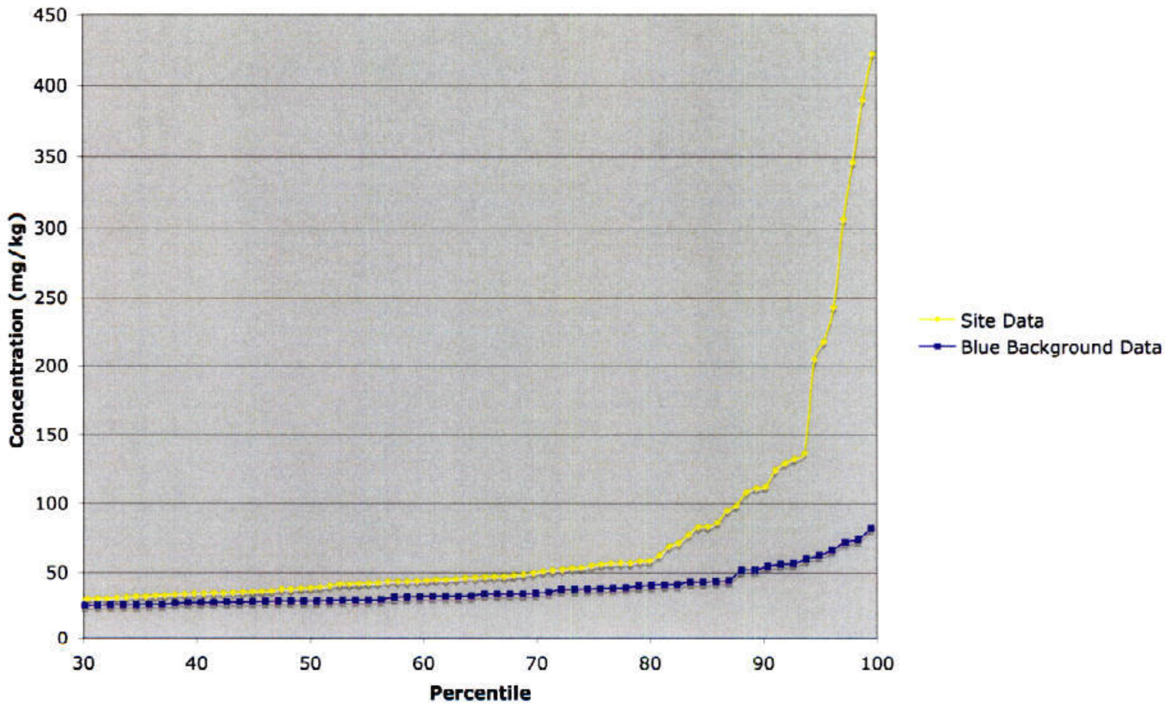
Site Versus Background Concentrations - Beryllium in Soil
Quantile Plot



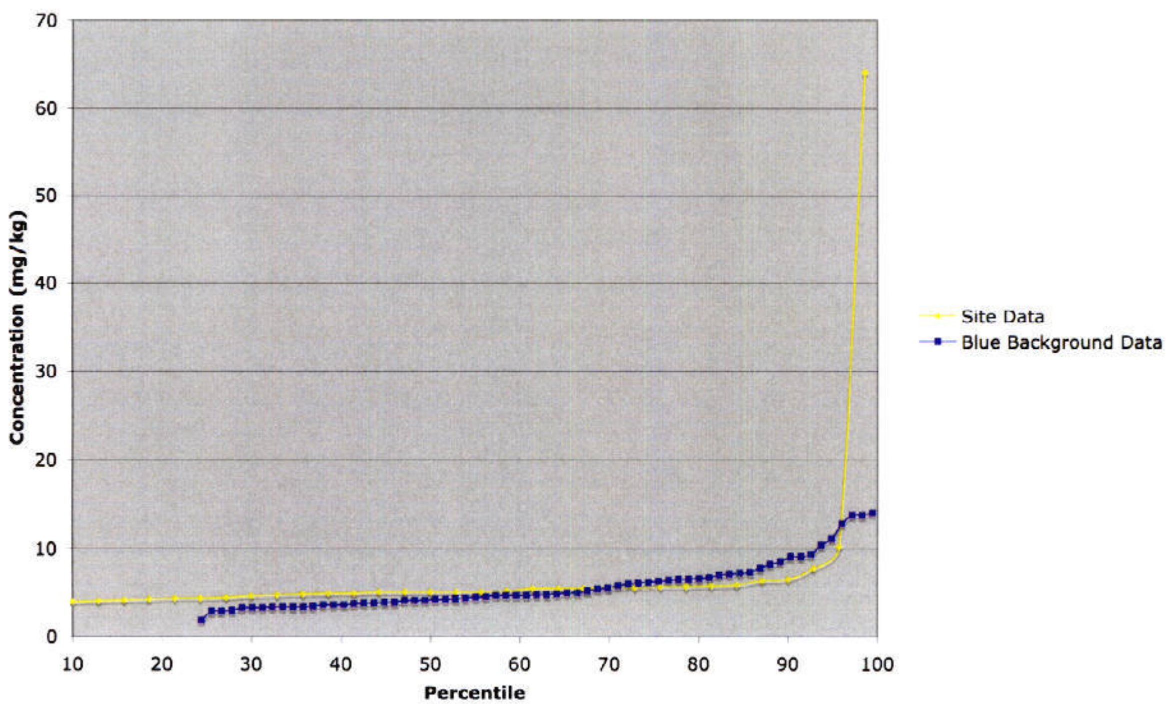

Site Versus Background Concentrations - Calcium in Soil
35000
30000
25000
20000
15000
10000
5000
0
Concentration (mg/kg)
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Site Data
Blue Background Data


Site Versus Background Concentrations - Cadmium in Soil Quantile Plot
35
30
25
20
15
10
5
0
Concentration (mg/kg)
30
40
50
60
70
80
90
100
Percentile
Site Data
Blue Background Data

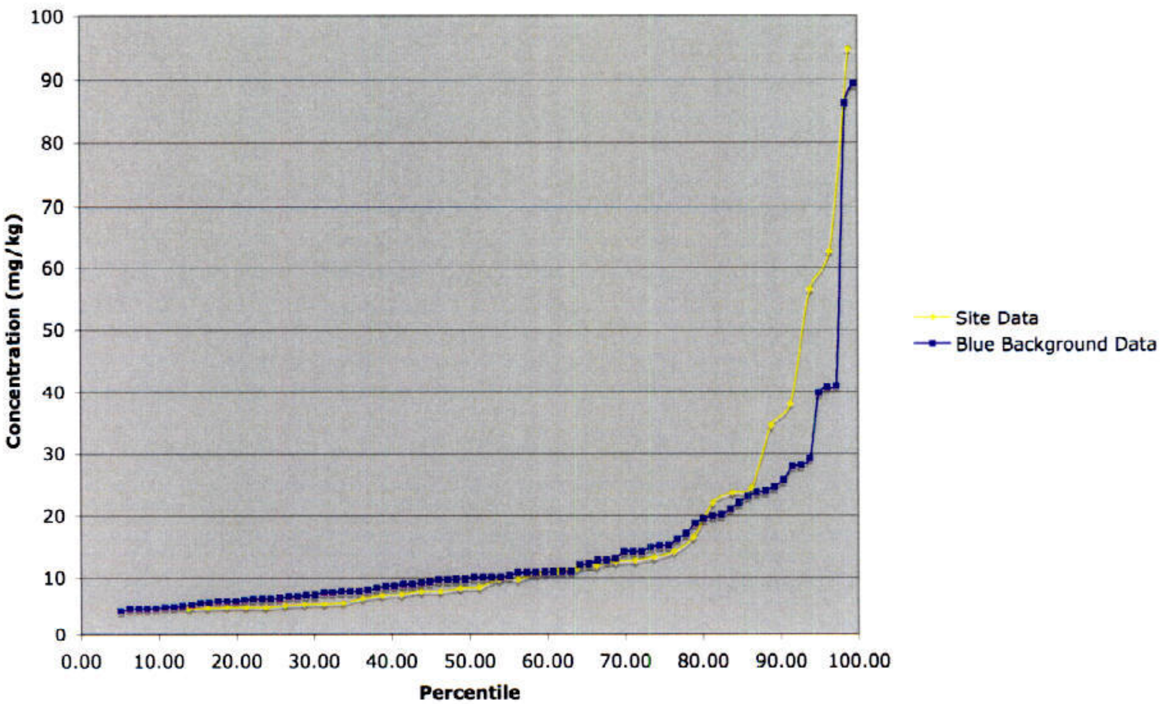
Site Versus Background Concentrations - Chromium in Soil Quantile Plot



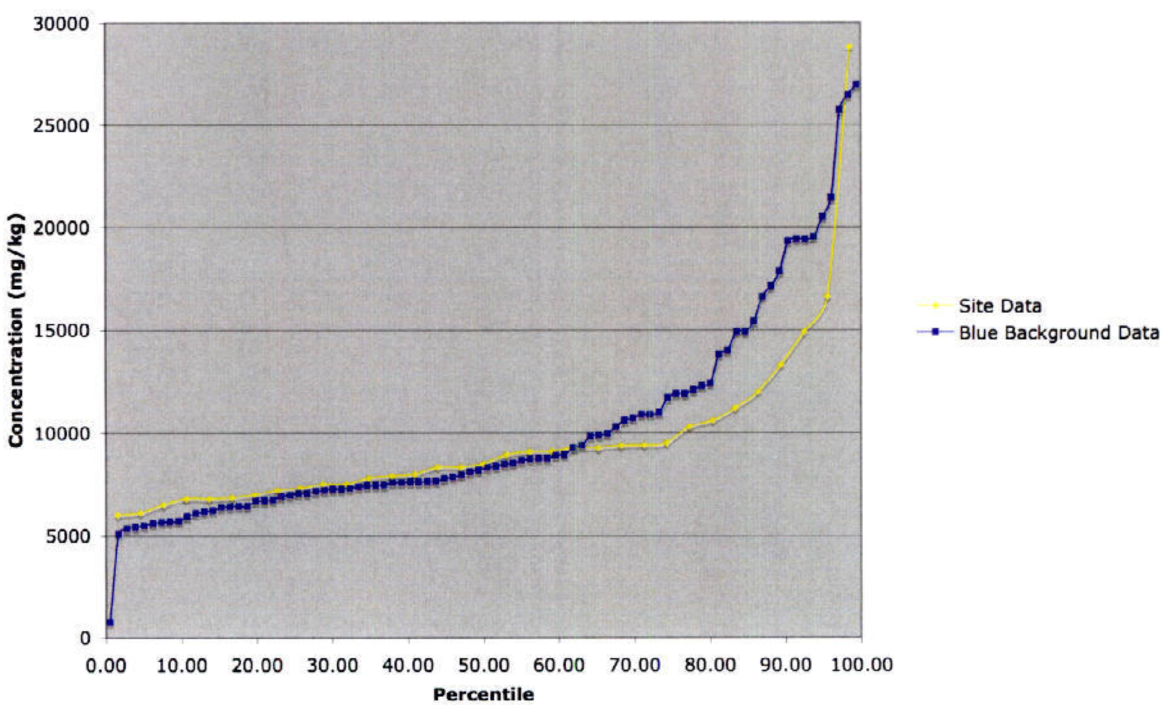
Site Versus Background Concentrations - Cobalt in Soil



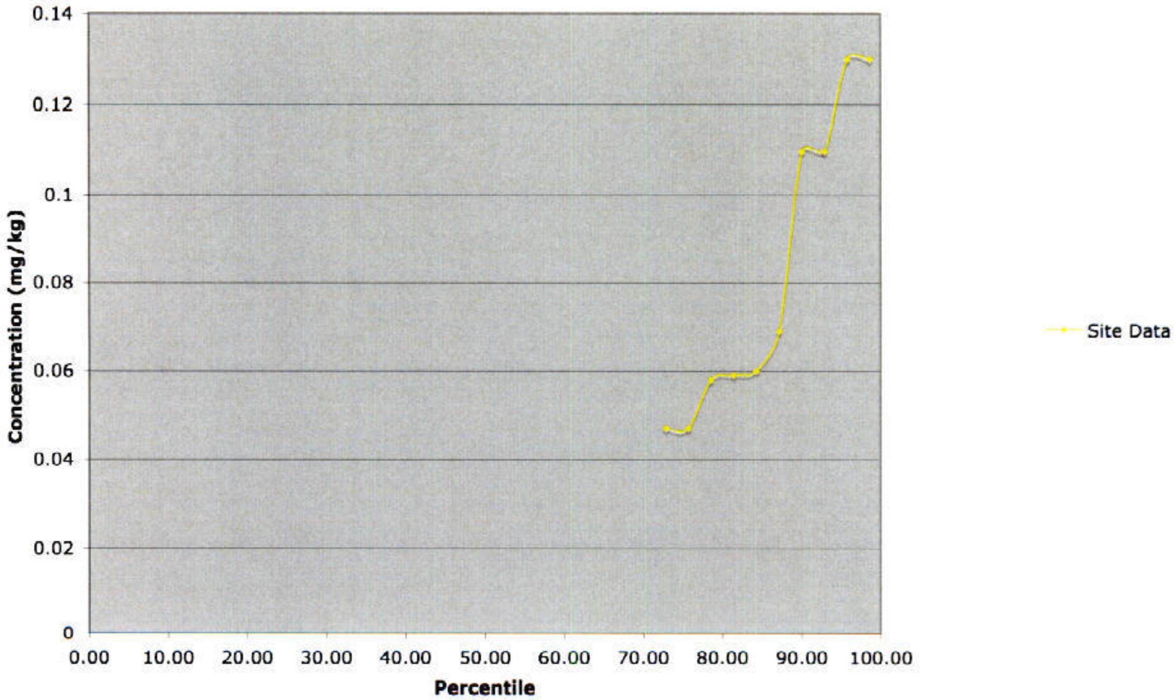
Site Versus Background Concentrations - Copper in Soil
Quantile Plot



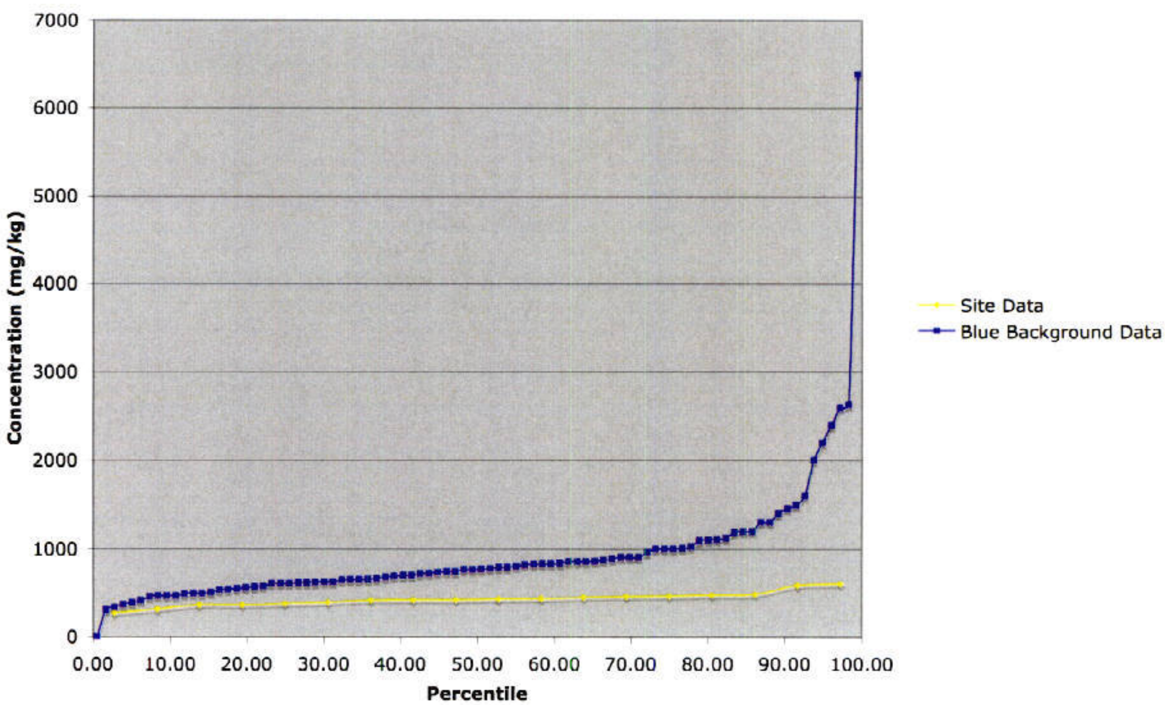
Site Versus Background Concentrations -Iron in Soil
Quantile Plot

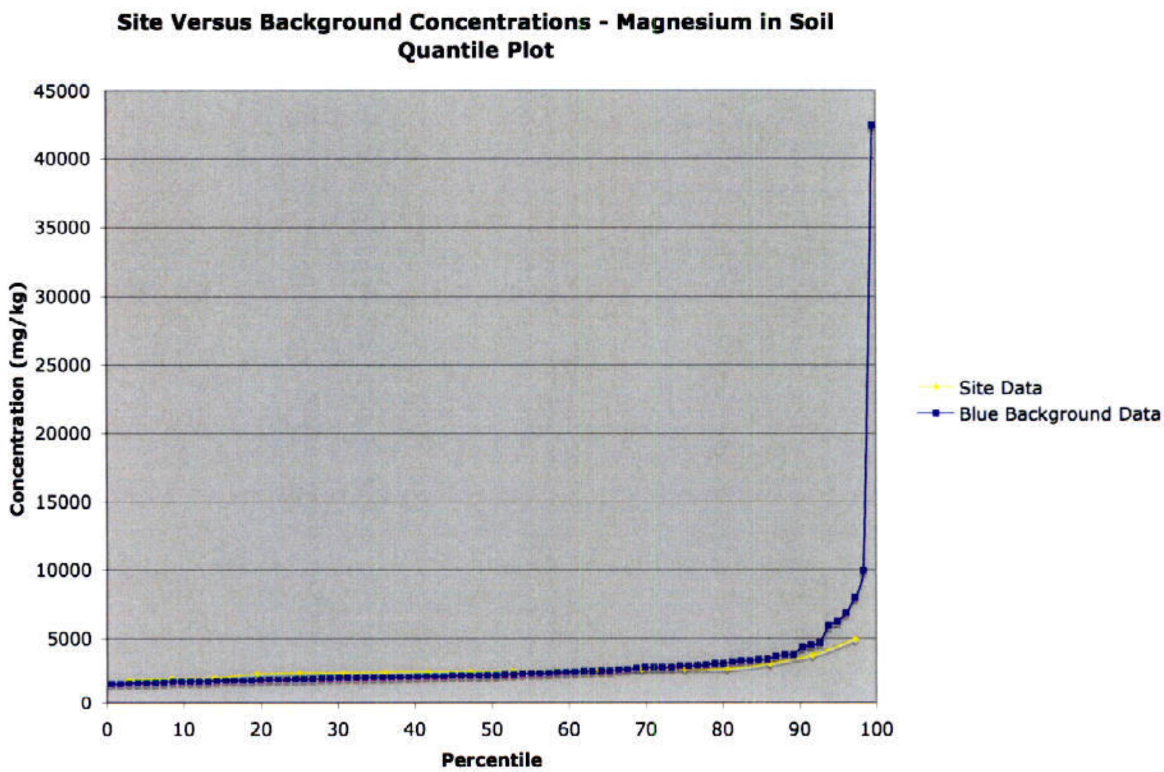


Site Versus Background Concentrations - Mercury in Soil
Quantile Plot

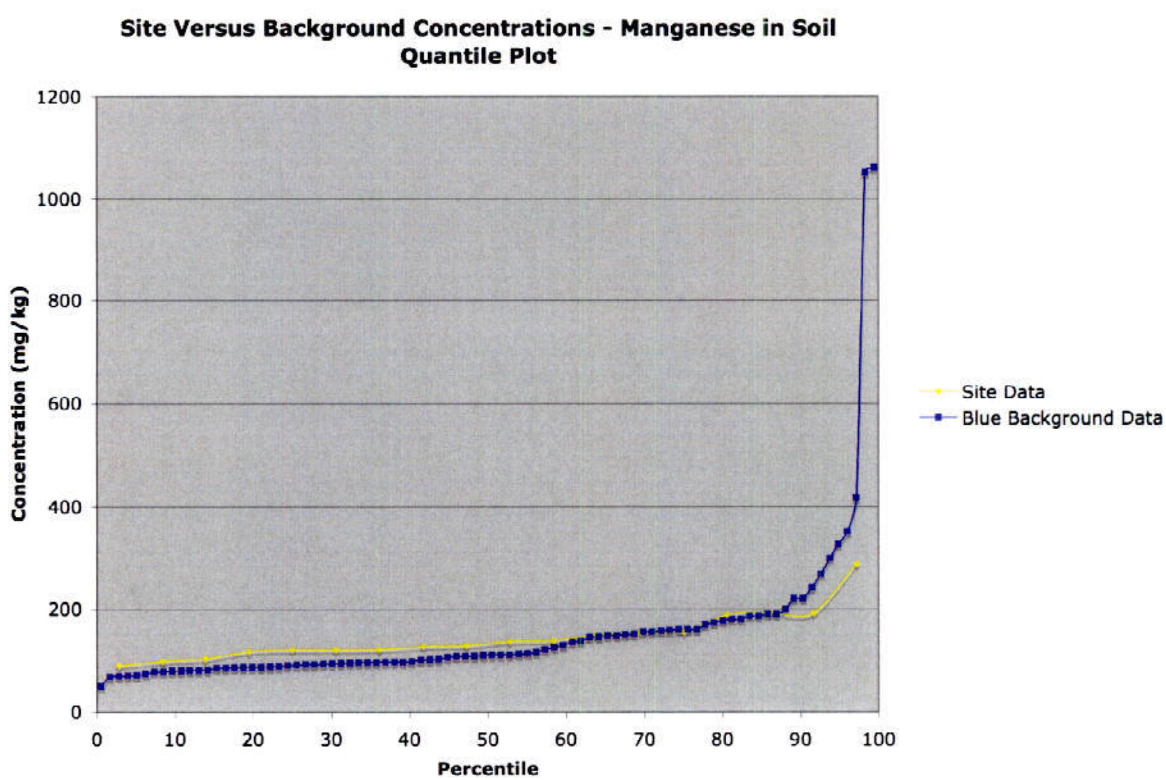


Site Versus Background Concentrations - Potassium in Soil
Quantile Plot



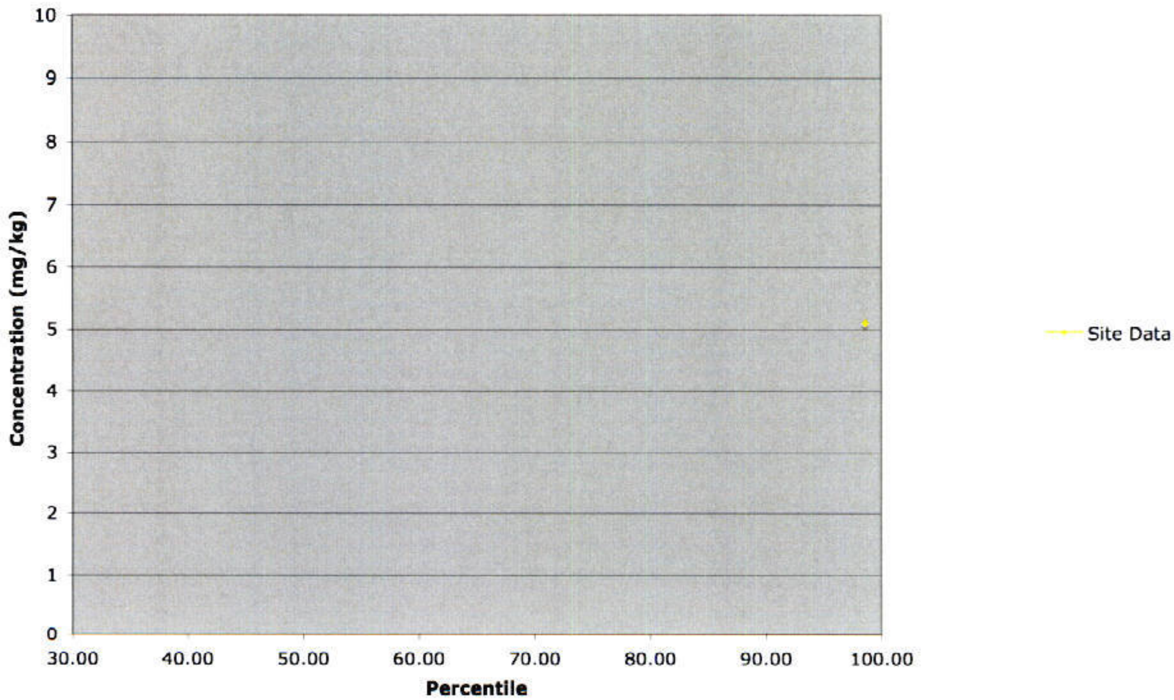


Site Versus Background Concentrations - Magnesium in Soil
Quantile Plot
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Concentration (mg/kg)
0
10
20
30
40
50
60
70
80
90
100
Percentile
Site Data
Blue Background Data

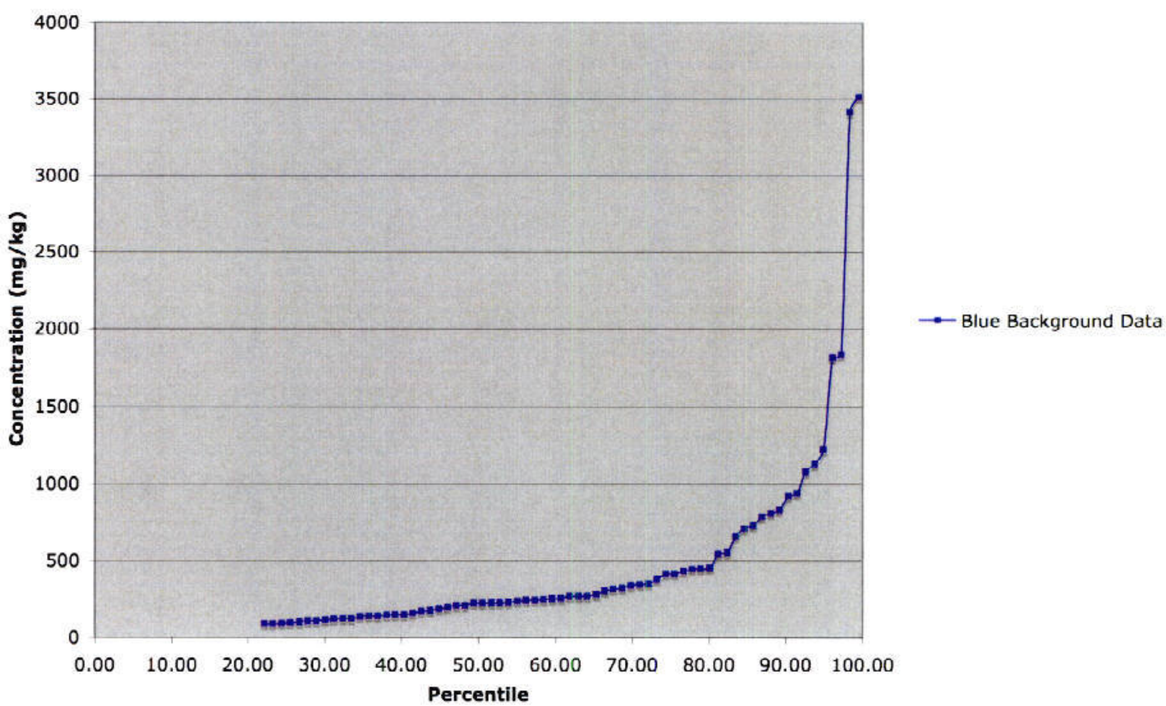


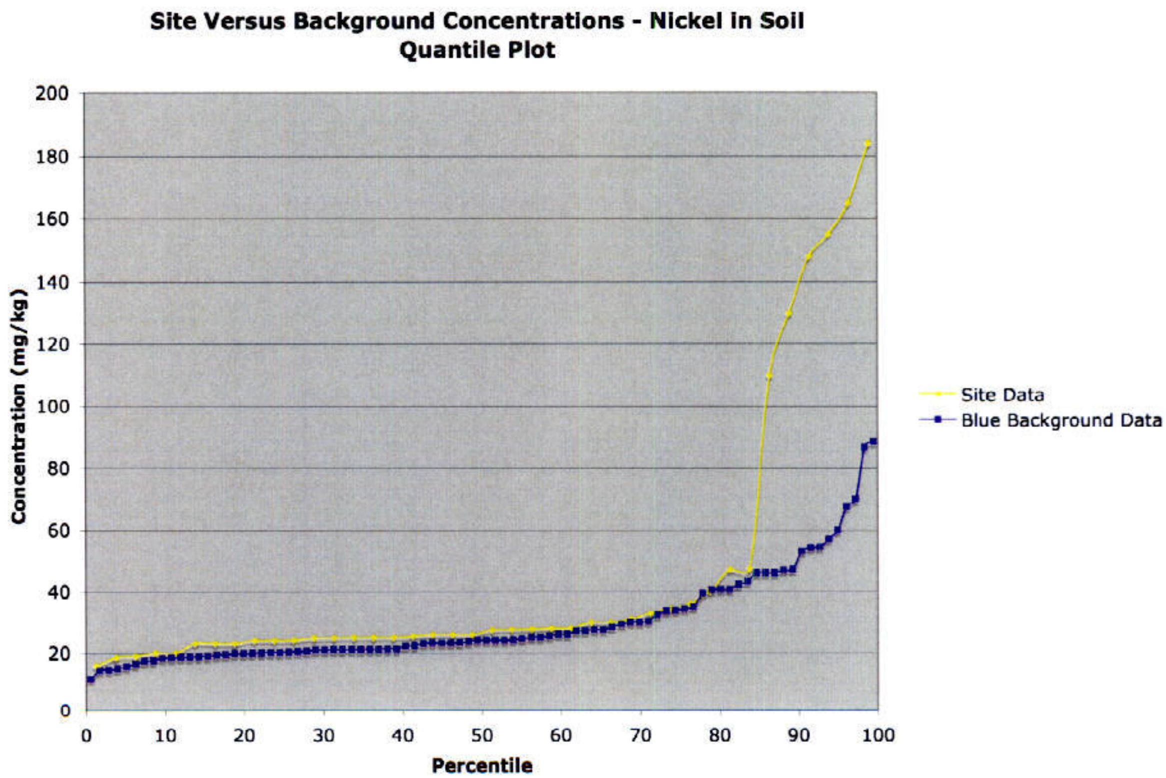
Site Versus Background Concentrations - Manganese in Soil
Quantile Plot
1200
1000
800
600
400
200
0
Concentration (mg/kg)
0
10
20
30
40
50
60
70
80
90
100
Percentile
Site Data
Blue Background Data

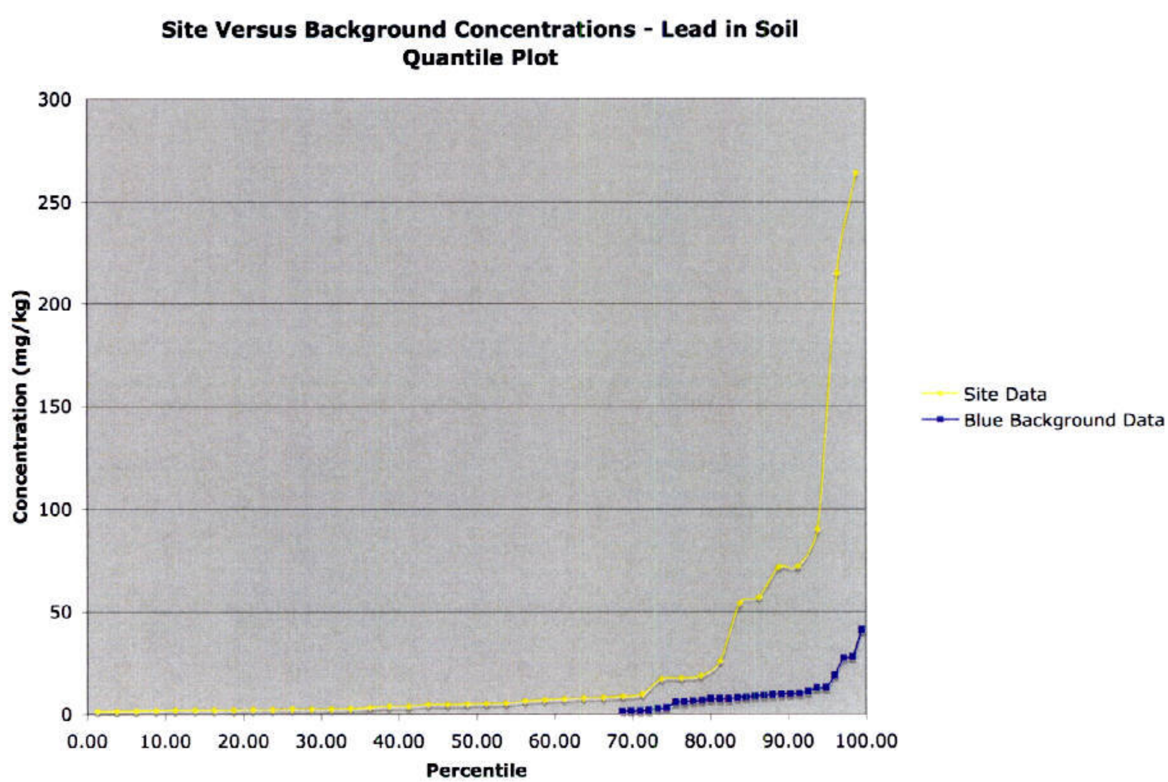
Site Versus Background Concentrations - Molybdenum in Soil
Quantile Plot



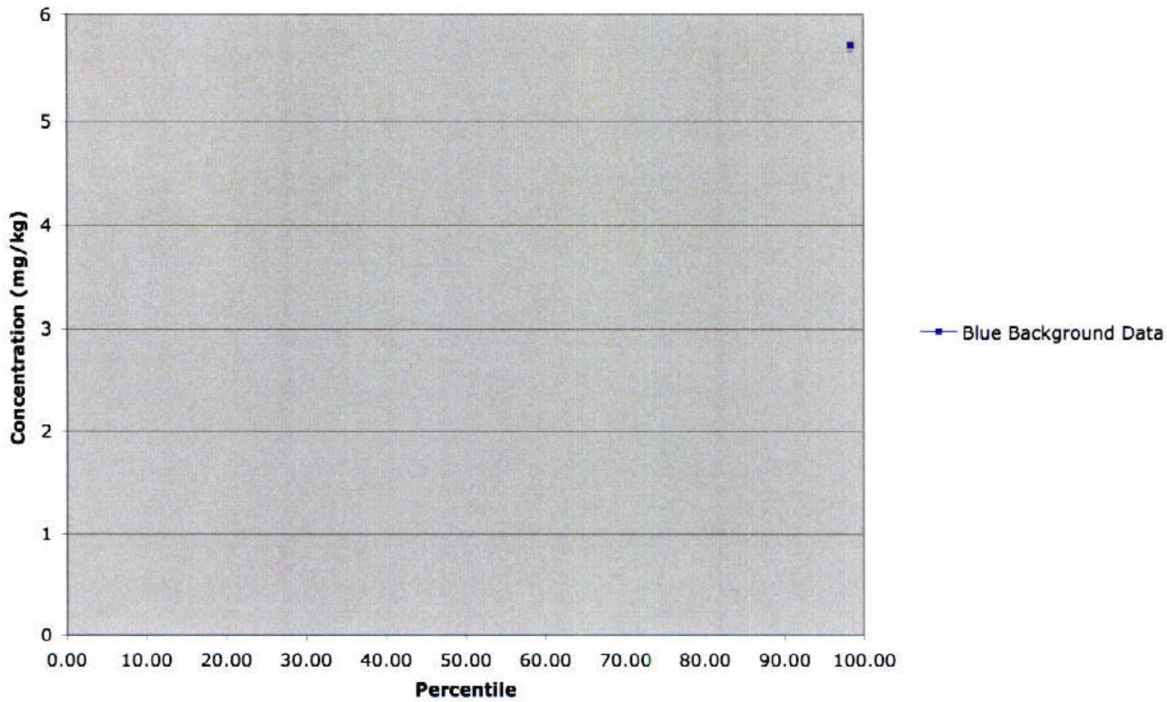
Site Versus Background Concentrations - Sodium in Soil
Quantile Plot



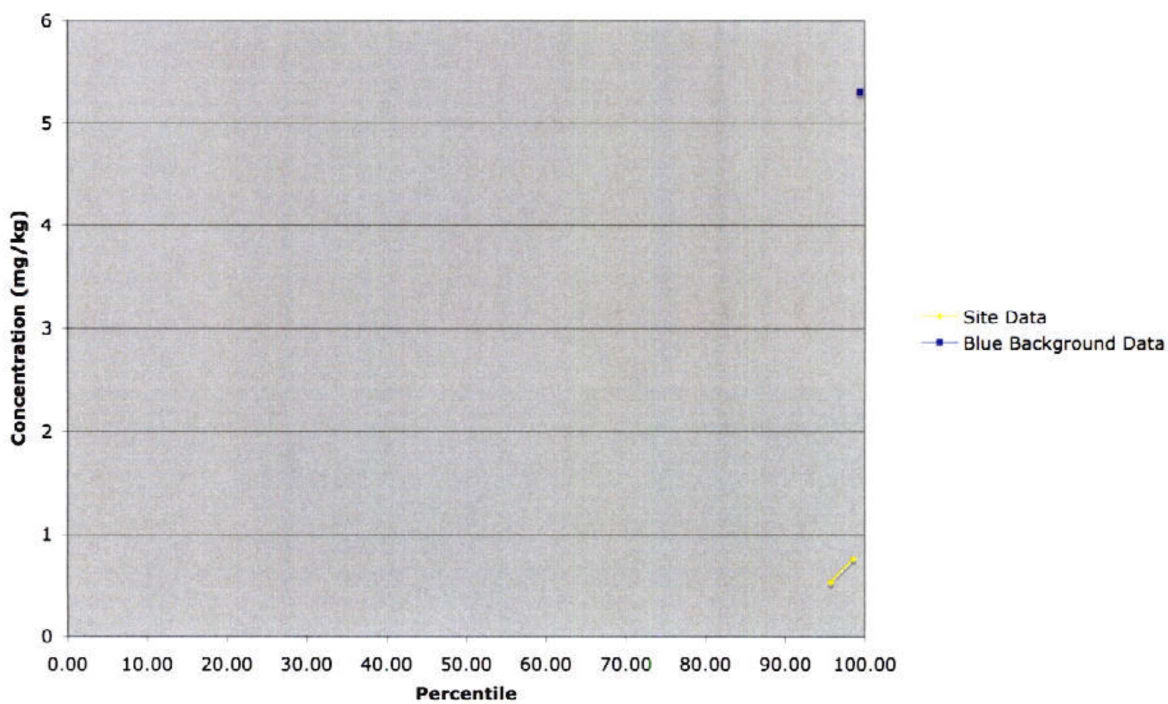

Site Versus Background Concentrations - Nickel in Soil
Quantile Plot
Concentration (mg/kg)
0
20
40
60
80
100
120
140
160
180
200
0
10
20
30
40
50
60
70
80
90
100
Percentile
Site Data
Blue Background Data

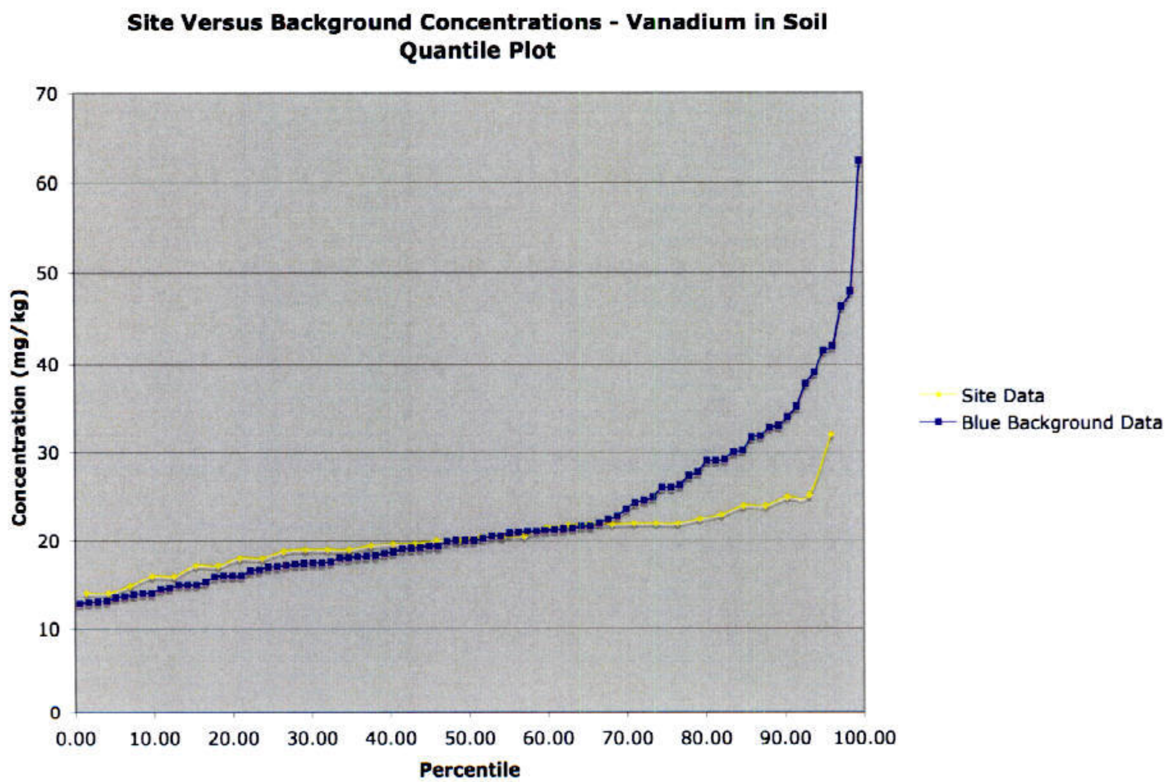

Site Versus Background Concentrations - Lead in Soil
Quantile Plot
Concentration (mg/kg)
0
50
100
150
200
250
300
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Site Data
Blue Background Data

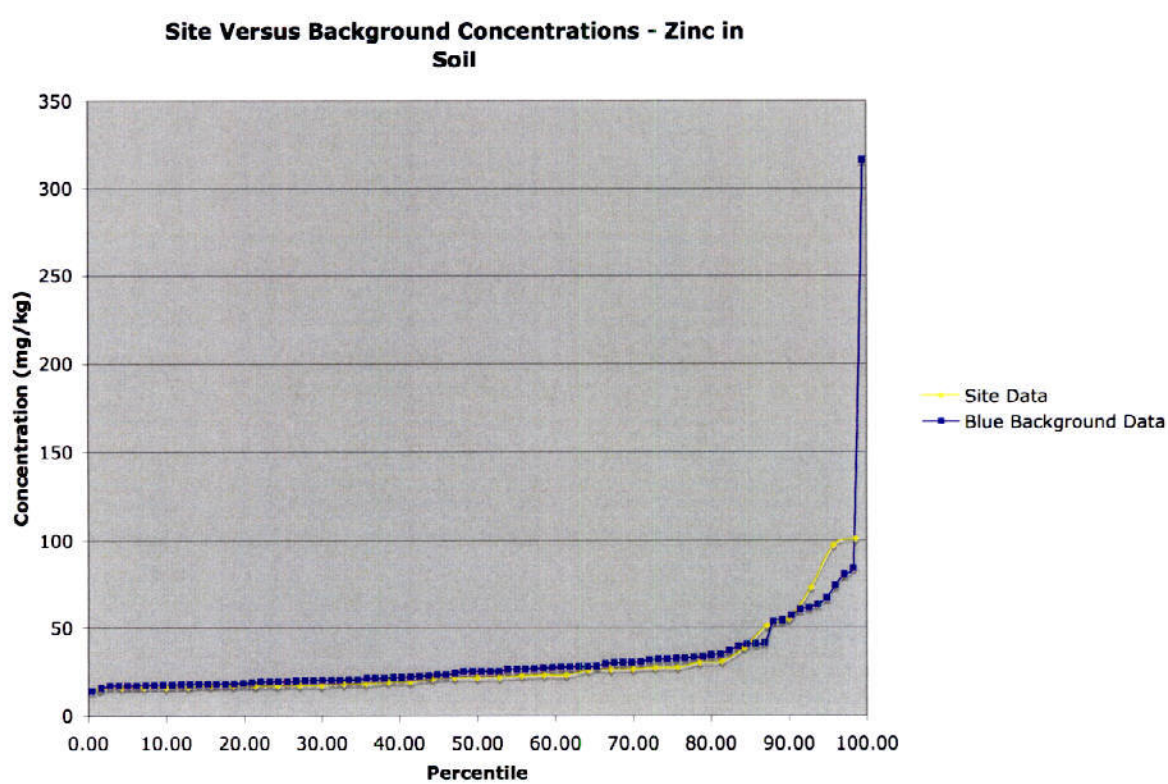
Site Versus Background Concentrations - Selenium in Soil
Quantile Plot



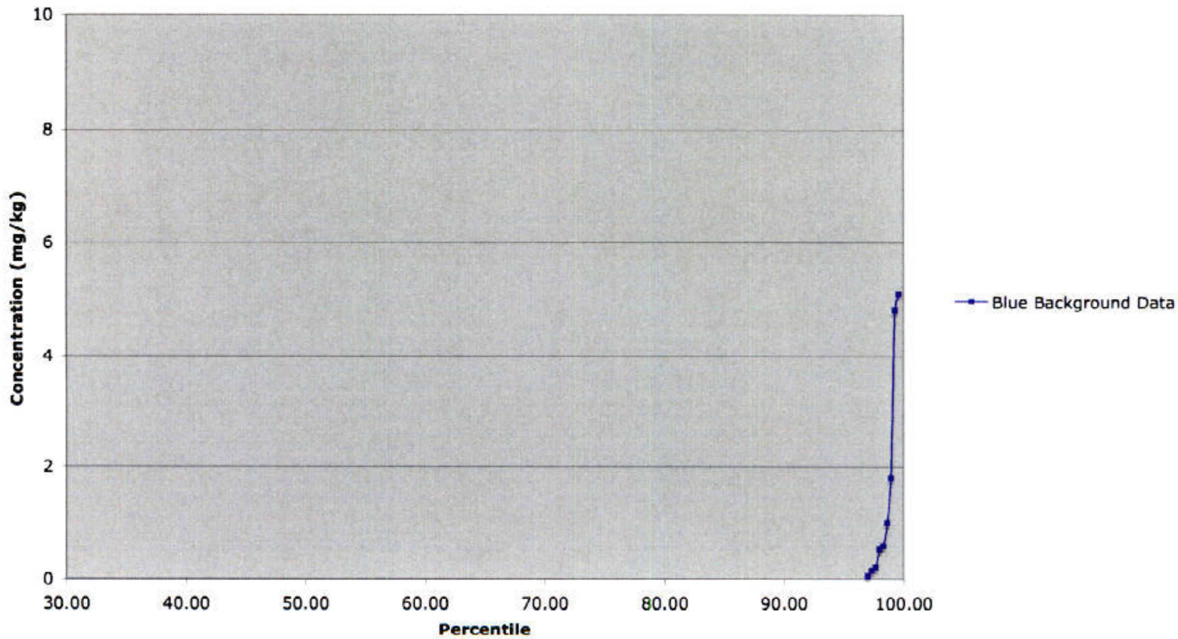
Site Versus Background Concentrations - Thallium in Soil
Quantile Plot



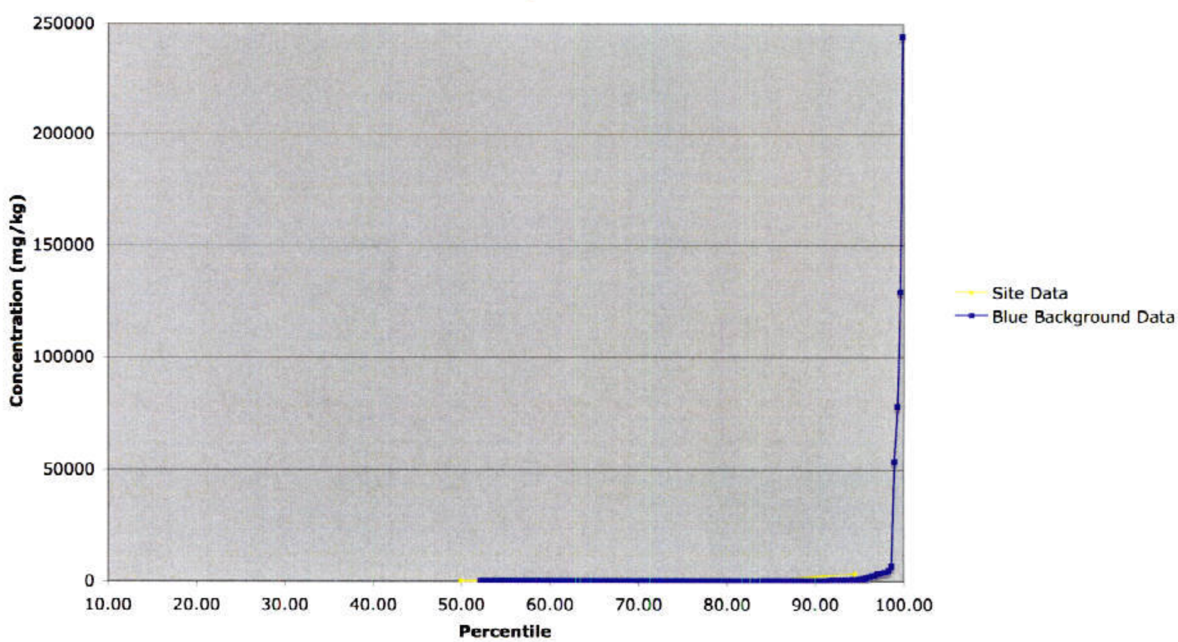

Site Versus Background Concentrations - Vanadium in Soil
Quantile Plot
Concentration (mg/kg)
70
60
50
40
30
20
10
0
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Site Data
Blue Background Data


Site Versus Background Concentrations - Zinc in Soil
Concentration (mg/kg)
350
300
250
200
150
100
50
0
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Site Data
Blue Background Data

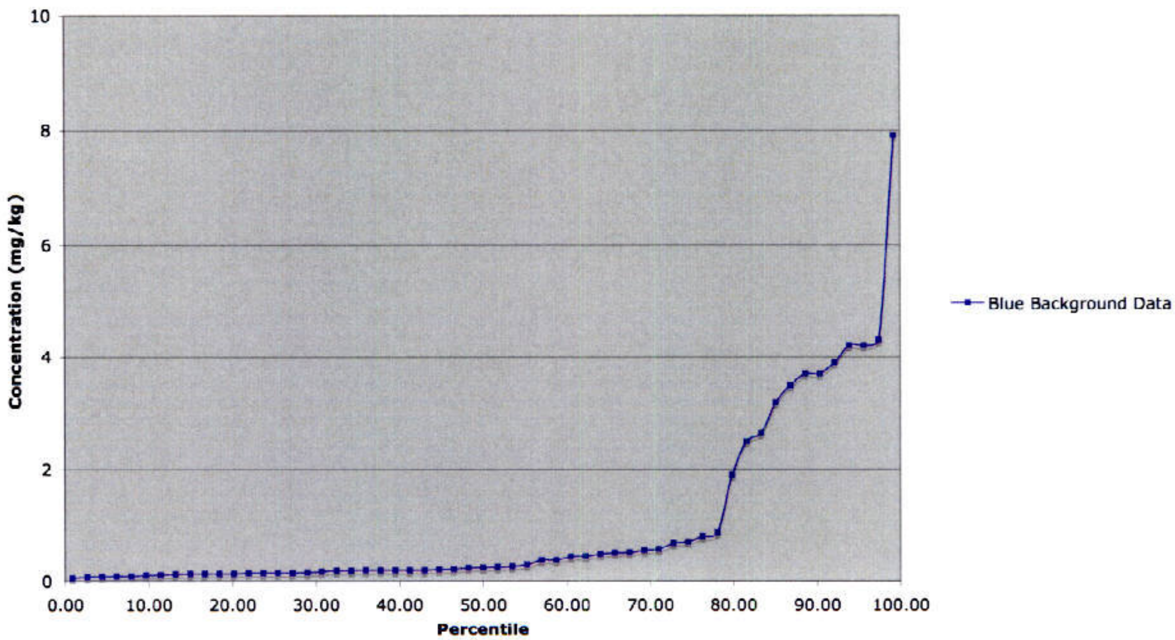
Site Versus Background Concentrations - Silver in Groundwater
Quantile Plot



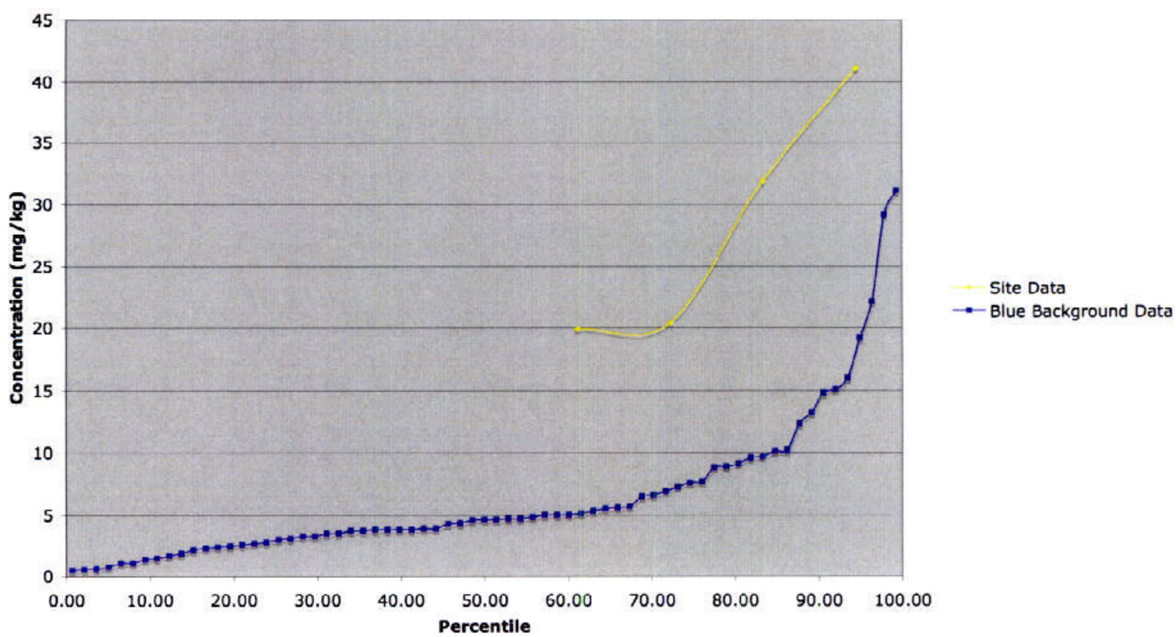
Site Versus Background Concentrations - Aluminum in Groundwater
Quantile Plot



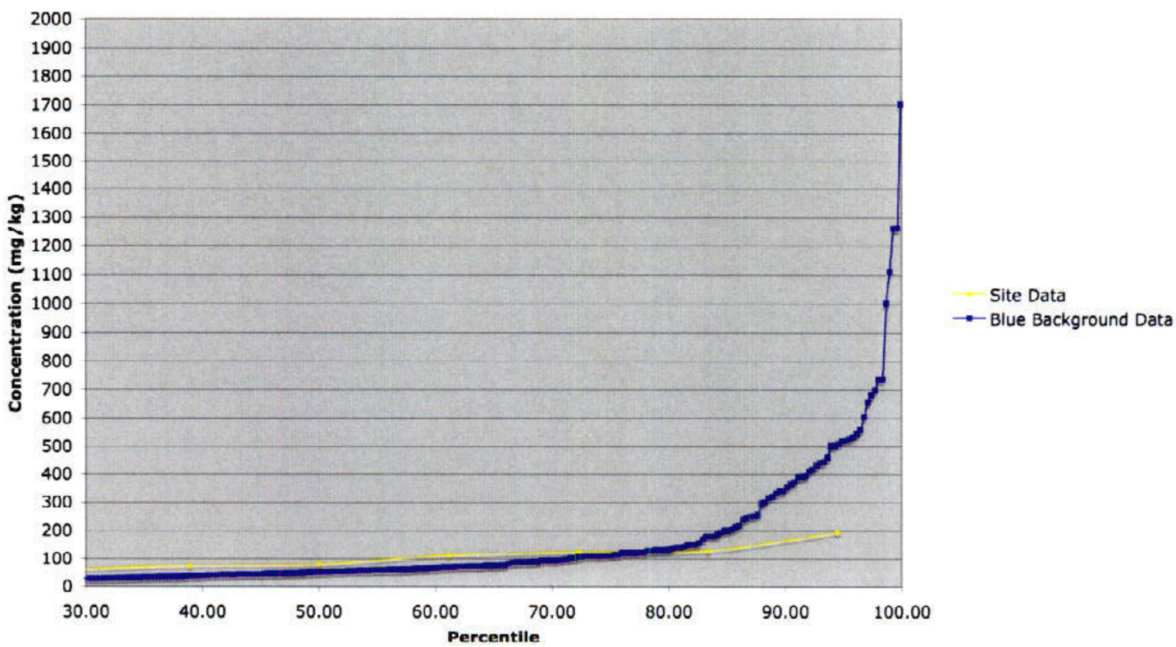
Site Versus Background Concentrations - Antimony in Groundwater
Quantile Plot



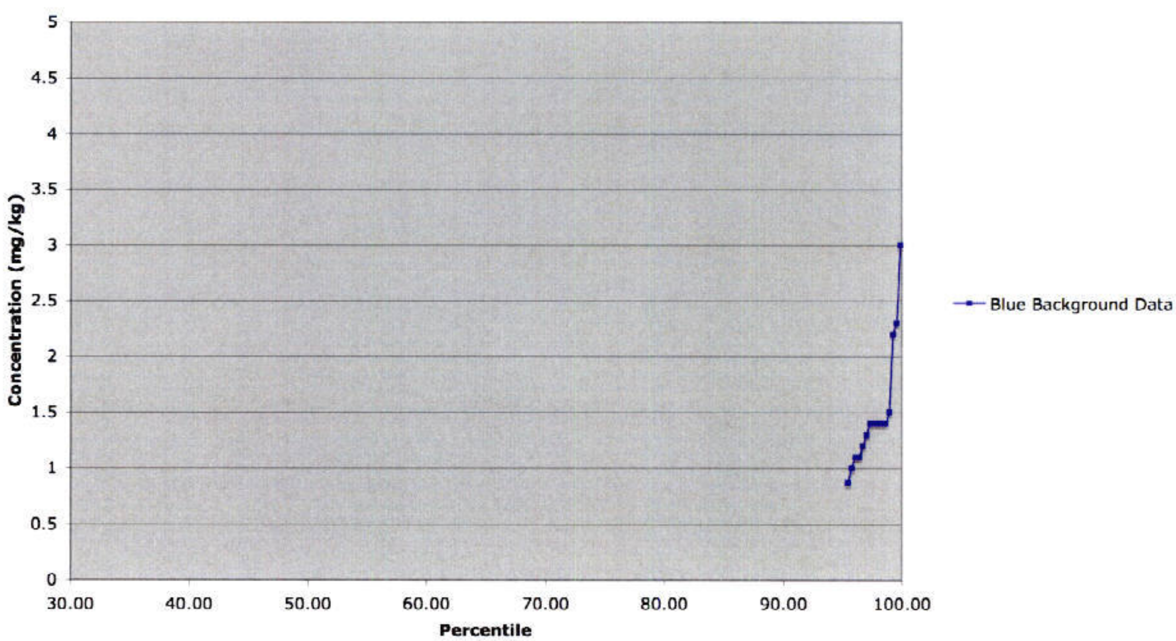
Site Versus Background Concentrations - Arsenic in Groundwater
Quantile Plot



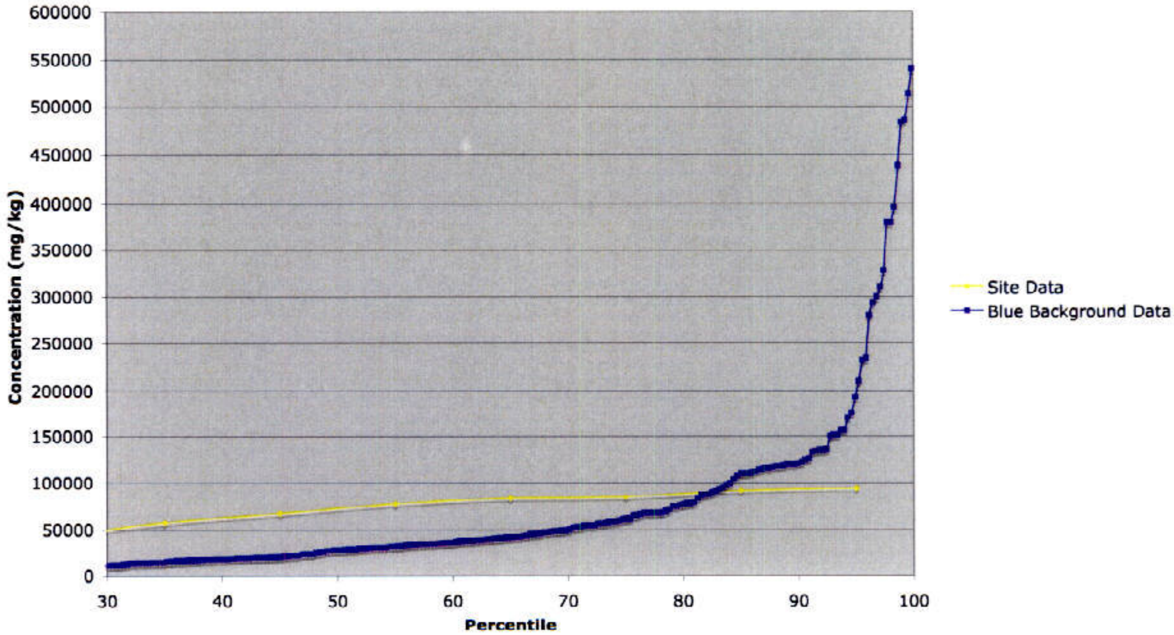
Site Versus Background Concentrations - Barium in Groundwater
Quantile Plot



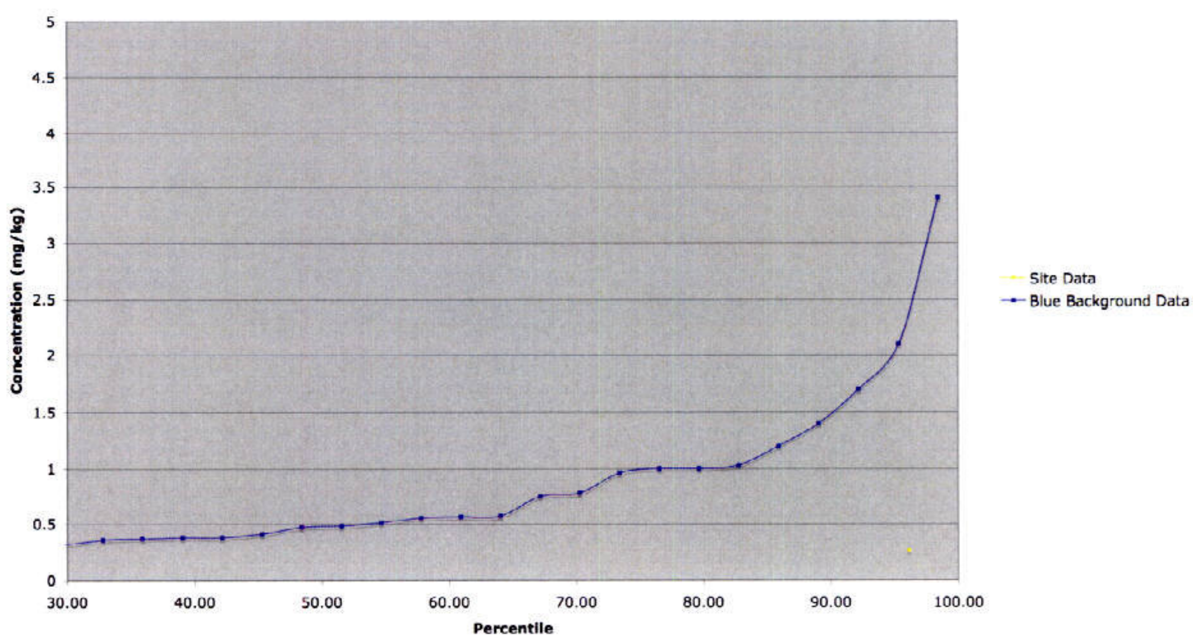
Site Versus Background Concentrations - Beryllium in Groundwater
Quantile Plot



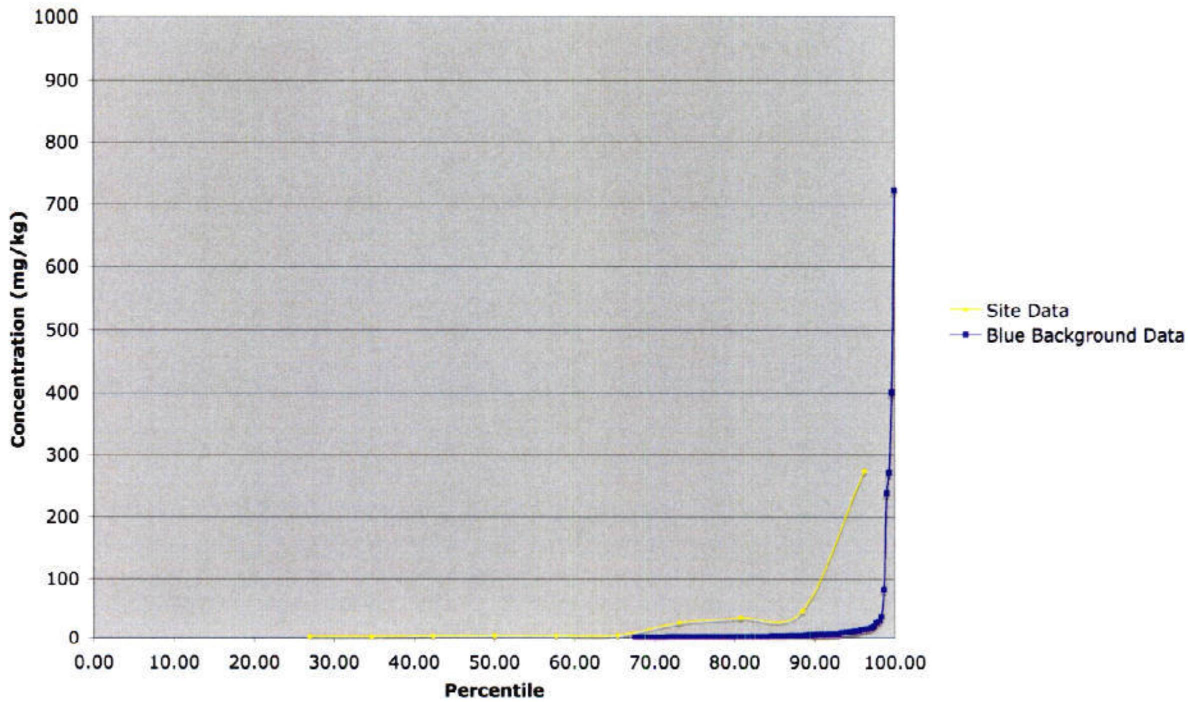
Site Versus Background Concentrations - Calcium in Groundwater
Quantile Plot



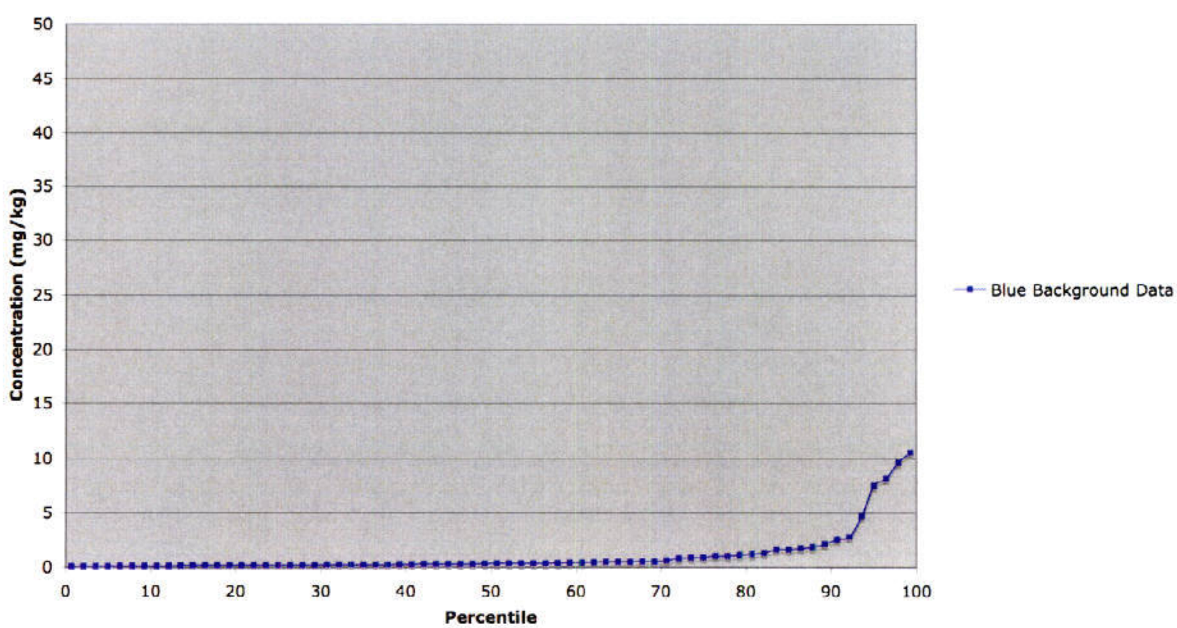
Site Versus Background Concentrations - Cadmium in Groundwater
Quantile Plot

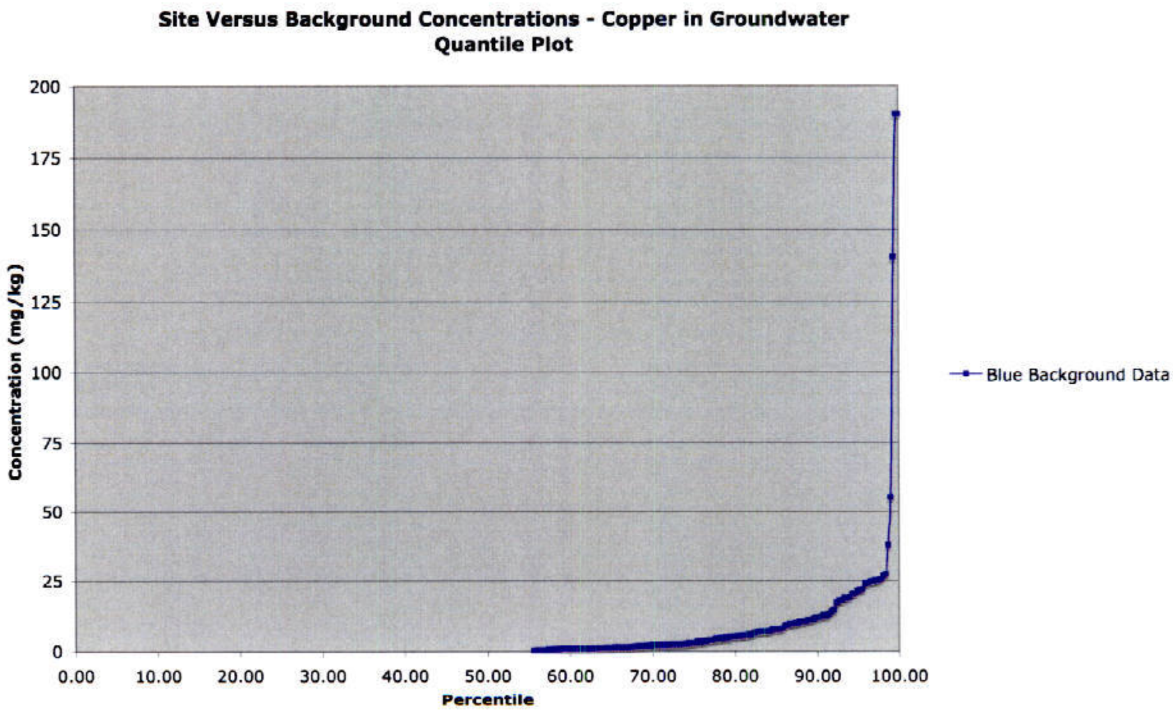


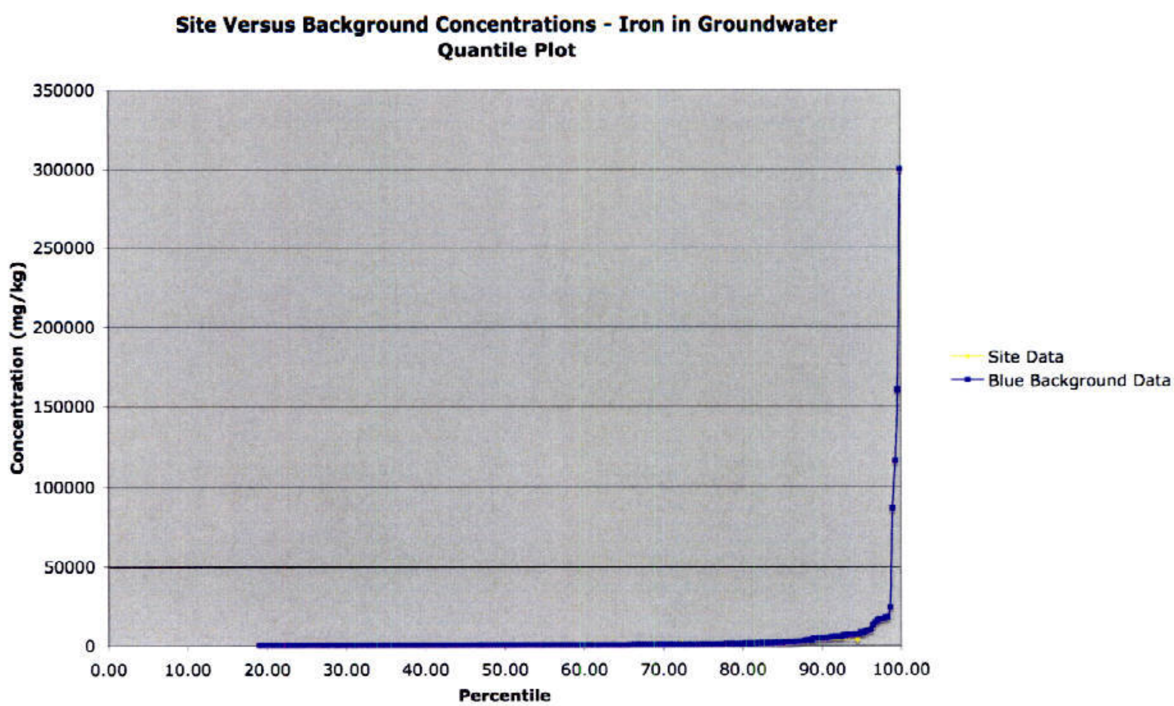
Site Versus Background Concentrations - Chromium in Groundwater
Quantile Plot



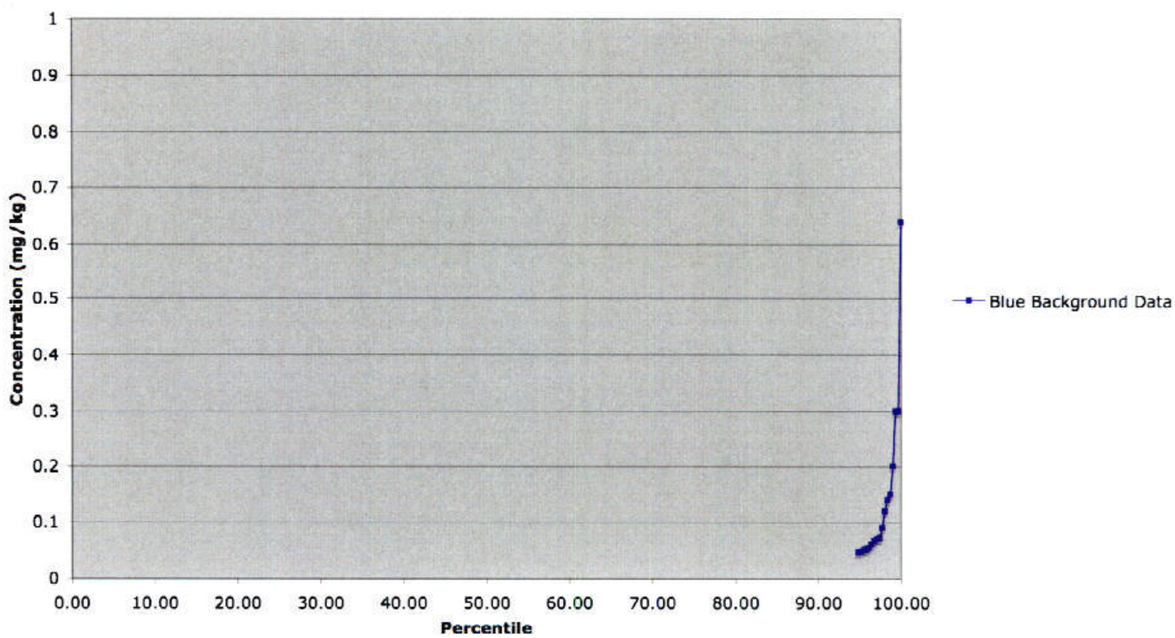
Site Versus Background Concentrations - Cobalt in Groundwater



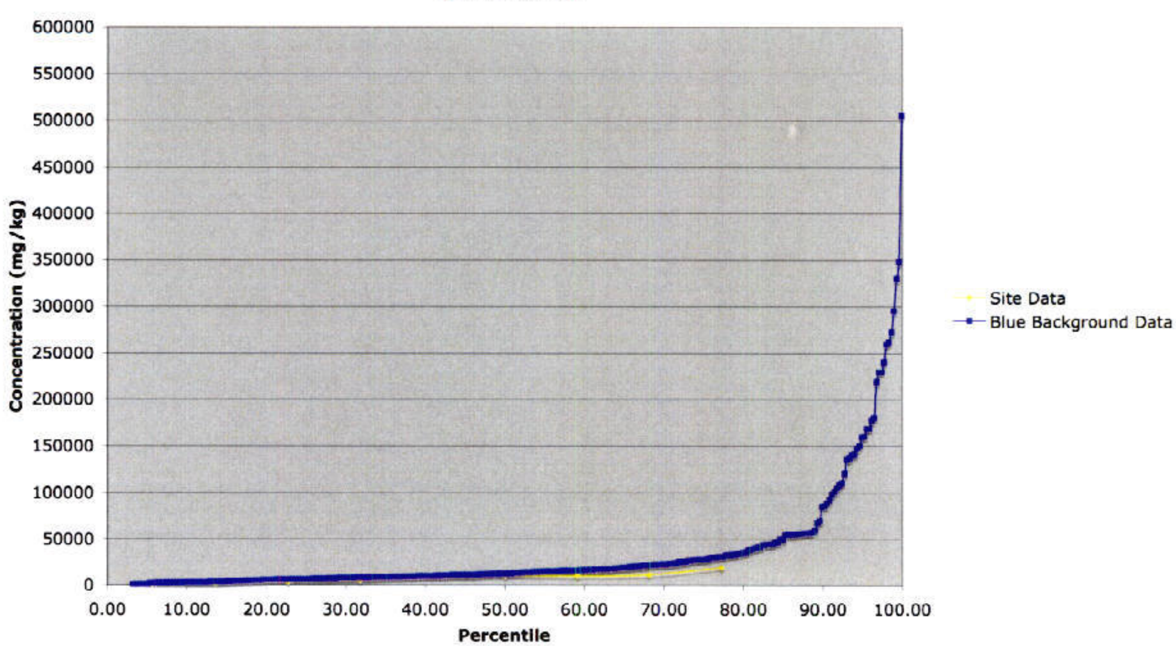

Site Versus Background Concentrations - Copper in Groundwater
Quantile Plot
200
175
150
125
100
75
50
25
0
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Concentration (mg/kg)
Blue Background Data


Site Versus Background Concentrations - Iron in Groundwater
Quantile Plot
350000
300000
250000
200000
150000
100000
50000
0
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Concentration (mg/kg)
Site Data
Blue Background Data

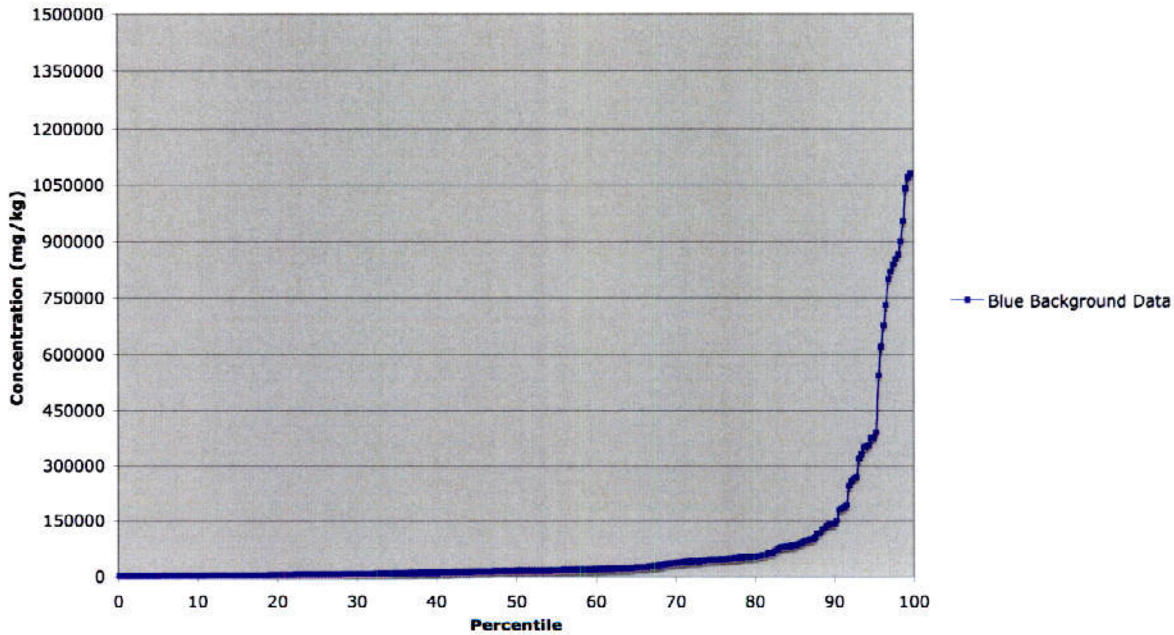
Site Versus Background Concentrations - Mercury in Groundwater
Quantile Plot



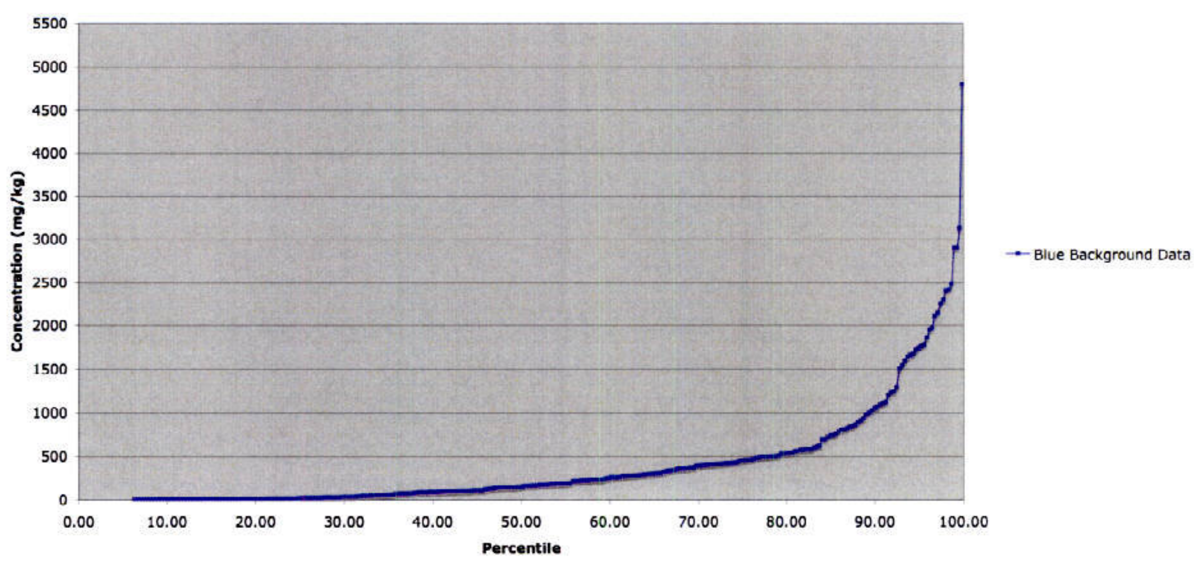
Site Versus Background Concentrations - Potassium in Groundwater
Quantile Plot



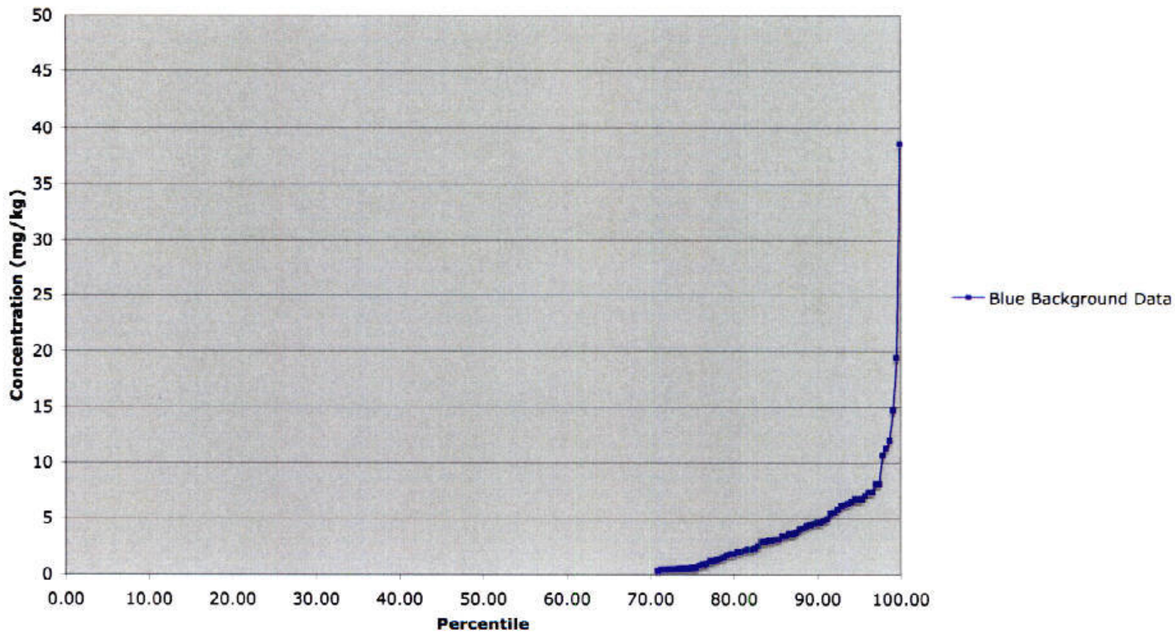
Site Versus Background Concentrations - Magnesium in Groundwater
Quantile Plot



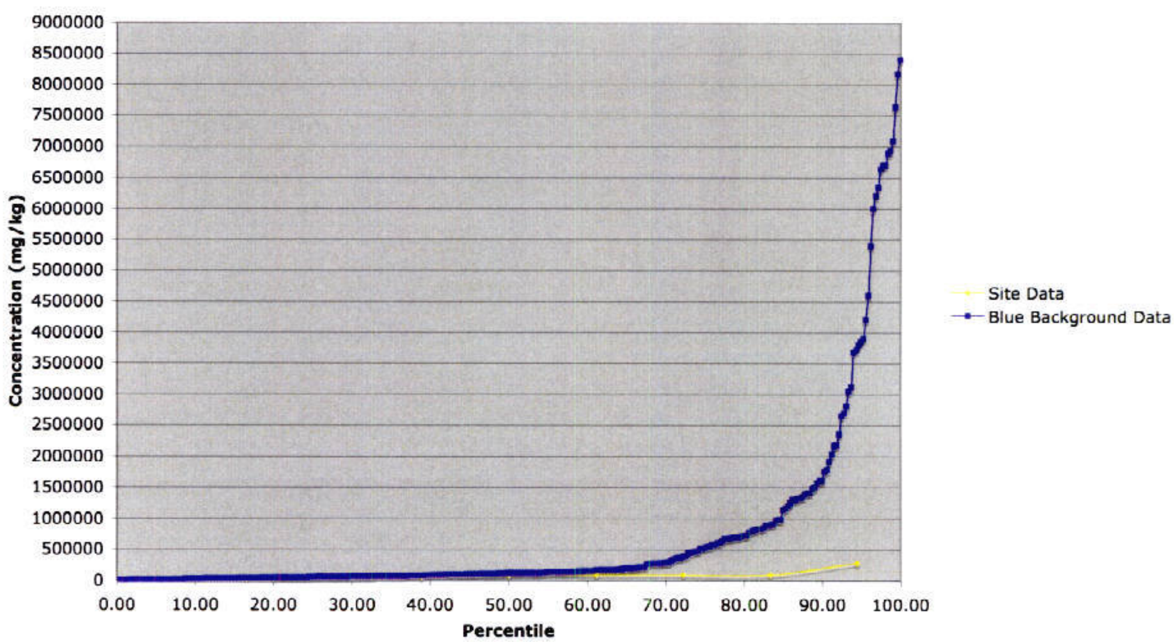
Site Versus Background Concentrations - Manganese in Groundwater
Quantile Plot

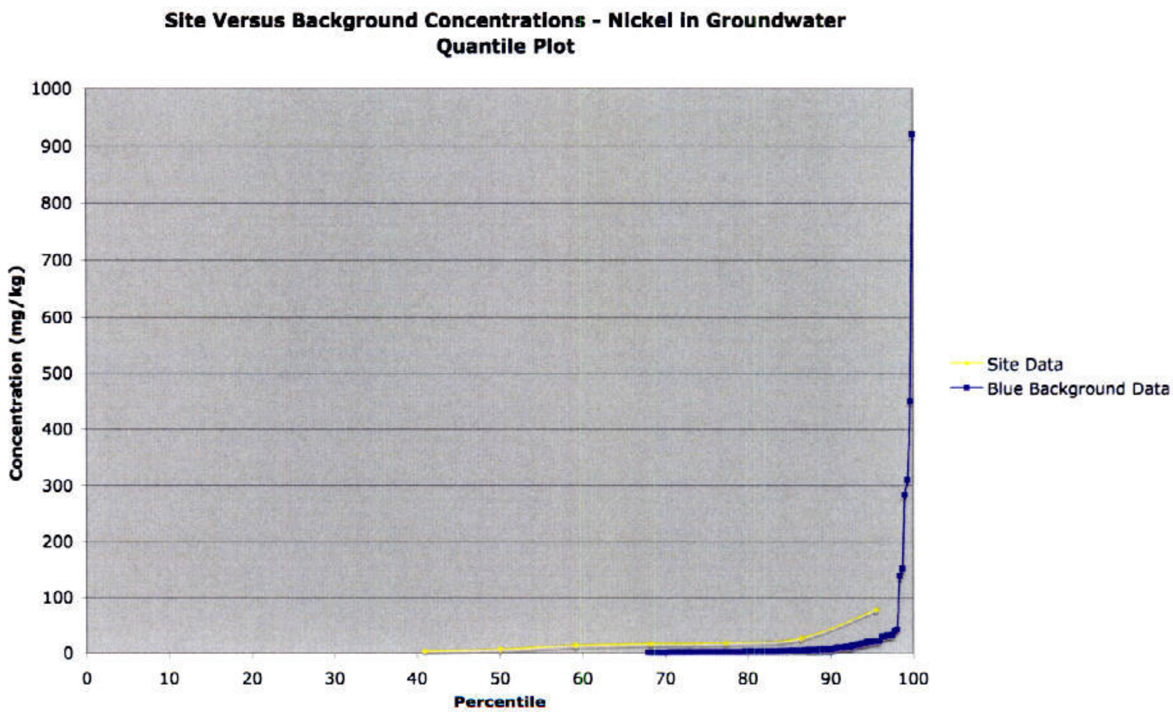


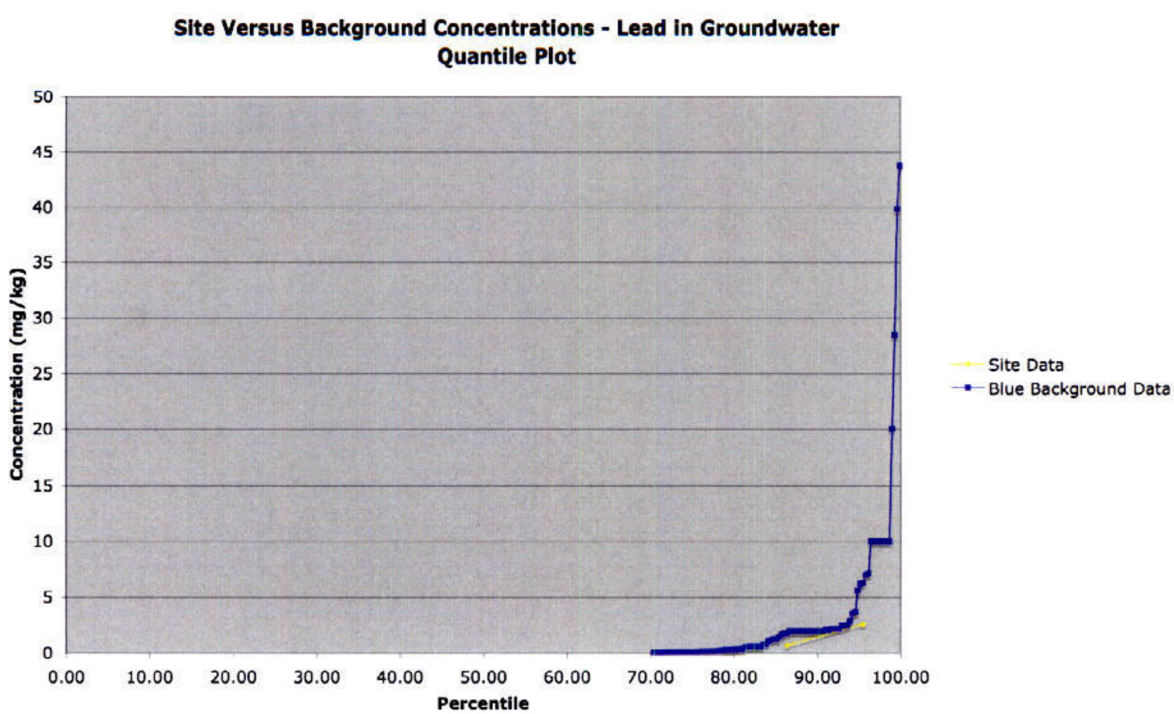
Site Versus Background Concentrations - Molybdenum in Groundwater
Quantile Plot

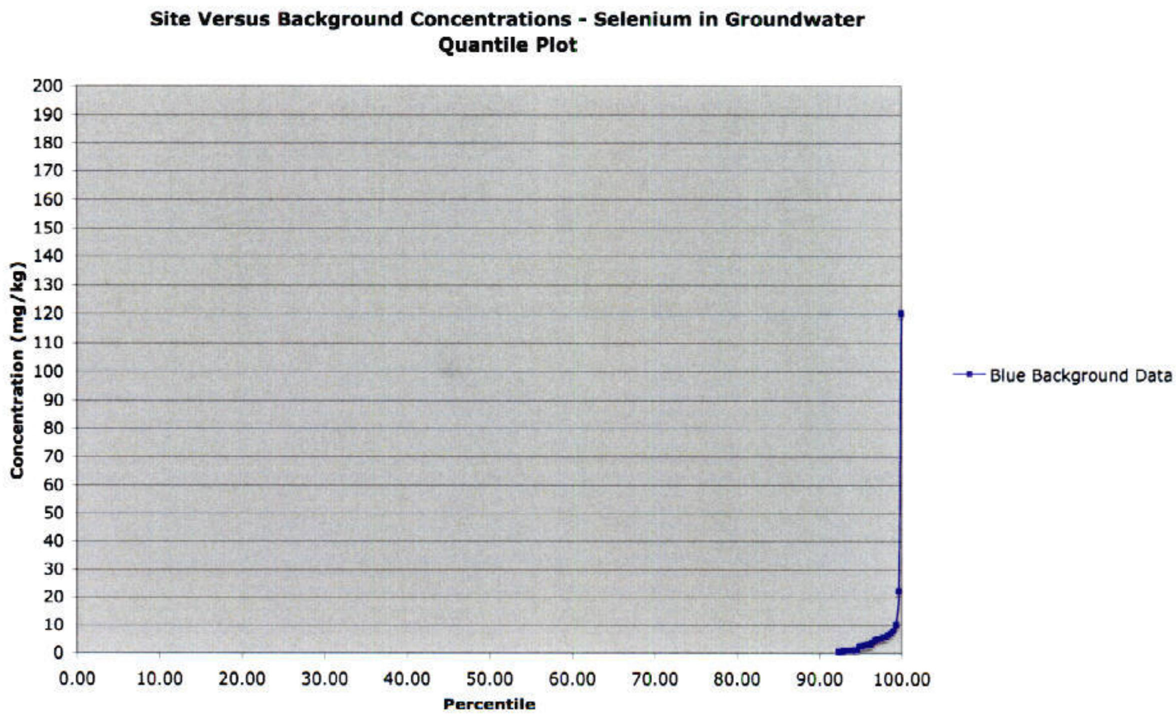


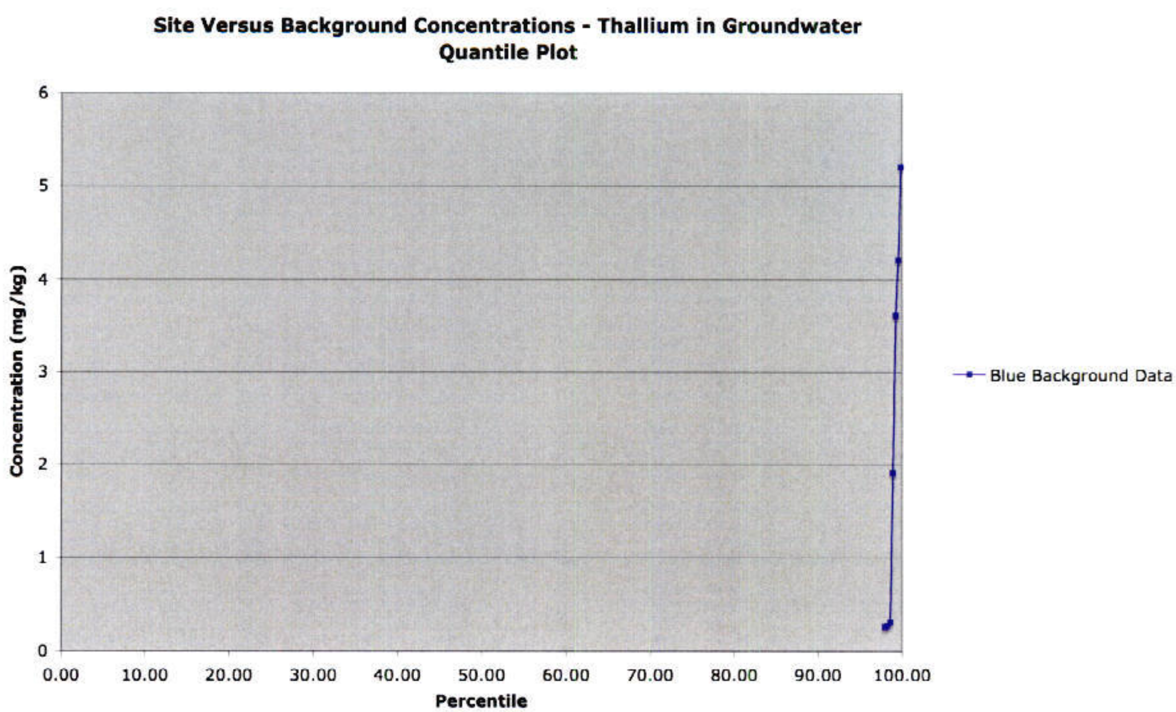
Site Versus Background Concentrations - Sodium in Groundwater
Quantile Plot

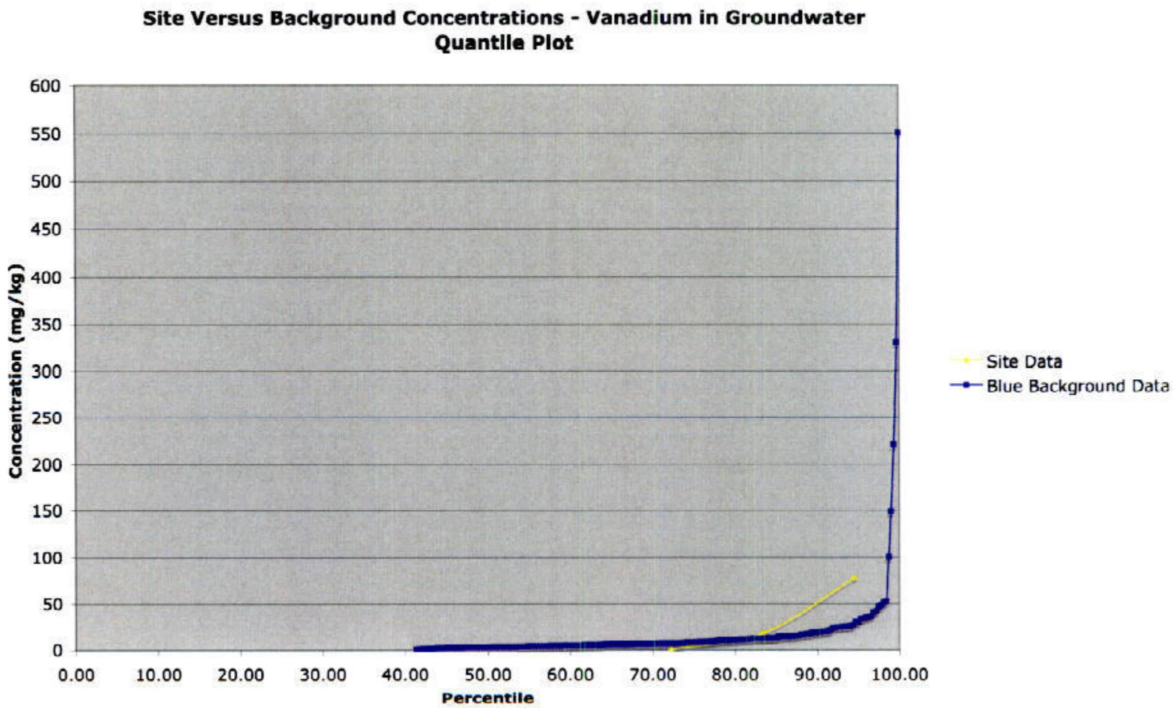


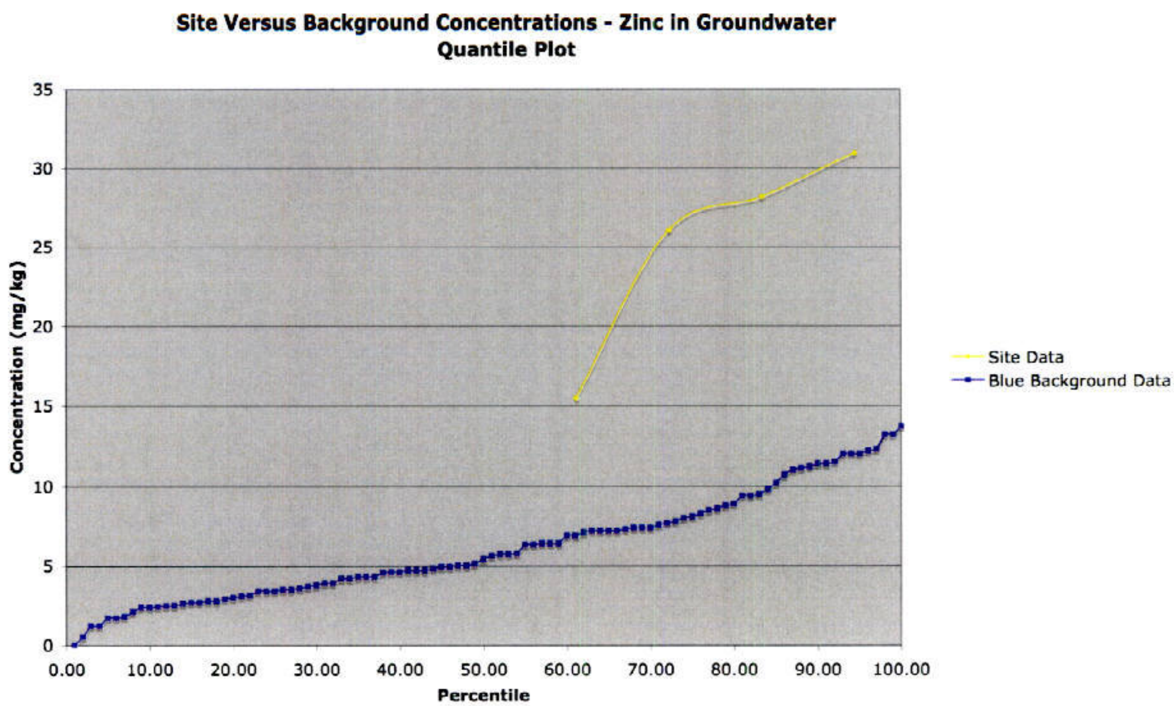

Site Versus Background Concentrations - Nickel in Groundwater
Quantile Plot
Concentration (mg/kg)
1000
900
800
700
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
80
90
100
Percentile
Site Data
Blue Background Data


Site Versus Background Concentrations - Lead in Groundwater
Quantile Plot
Concentration (mg/kg)
50
45
40
35
30
25
20
15
10
5
0
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Site Data
Blue Background Data


Site Versus Background Concentrations - Selenium in Groundwater
Quantile Plot
Concentration (mg/kg)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Blue Background Data


Site Versus Background Concentrations - Thallium in Groundwater
Quantile Plot
Concentration (mg/kg)
0
1
2
3
4
5
6
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Blue Background Data


Site Versus Background Concentrations - Vanadium in Groundwater
Quantile Plot
Concentration (mg/kg)
600
550
500
450
400
350
300
250
200
150
100
50
0
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Site Data
Blue Background Data


Site Versus Background Concentrations - Zinc in Groundwater
Quantile Plot
Concentration (mg/kg)
35
30
25
20
15
10
5
0
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Percentile
Site Data
Blue Background Data

Appendix C: Technical Memorandum
Updated Human Health Risk Assessment

C1.0 INTRODUCTION

The following Memorandum presents the updated human health risk assessment (HHRA) for the Industrial Wastewater Treatment Plant (IWTP) 360, Alameda Point, Alameda, CA. This document updates a risk evaluation entitled "*Draft Human Health Risk Assessment, Industrial Waste Treatment Plant 360, Hazardous Waste Facility Permit CA 2170023236, Alameda Point*" prepared in September 2004 by Tetra Tech EM Inc. for Naval Facilities Engineering Command, Southwest (NFEC SW), included in Appendix C in the previously submitted *Draft Amendment to Closure Summary Report* (ITSI, 2006). This Memorandum presents updated cancer risks and non-cancer hazard indices (HIs) for the hypothetical future residential, commercial/industrial, and construction scenarios consistent with current California Department of Toxic Substances Control's (DTSC) policy. This memorandum also addresses comments on the *Draft Amendment to Closure Summary Report* from DTSC. The updated cancer risk and non-cancer HI calculations for the hypothetical future residential, commercial/industrial, and construction scenarios are discussed below.

C2.0 CANCER RISK AND NON-CANCER HAZARD INDEX CALCULATIONS

The cancer risks and non-cancer HIs for the hypothetical future residential, commercial/industrial, and construction scenarios have been updated to be consistent with DTSC's current recommendations (DTSC, 2005) and toxicity values consistent with DTSC's hierarchy[1], and also to address comments from DTSC to the Draft Amendment to Closure Summary Report. The scenarios consist of the following:

- Hypothetical Future Residential (combined adult and child)
  - Ingestion of metals in both surface (0-1 foot below ground surface [bgs]) and subsurface soil (0-10 feet bgs)
  - Dermal contact of metals in both surface and subsurface soil
  - Inhalation of metals in both surface and subsurface soil
  - Ingestion of metals in groundwater

[1] The hierarchy of toxicity values used in this addendum is consistent with that used by California Environmental Protection Agency (CalEPA) in their modified version of the Johnson and Ettinger Model (http://www.dtsc.ca.gov/AssessingRisk/upload/HERD_Soil_Gas_Screening_Model_2005.xls). As used in this addendum, the lower of either the CalEPA Office of Environmental Health Hazard Assessment's (OEHHA) chronic Reference Exposure Level (RELs) or the inhalation RfCs reported by U.S. Environmental Protection Agency (USEPA) are to be used in the risk calculations.

  - Dermal contact of metals in groundwater
- Hypothetical Commercial/Industrial (adult only)
  - Ingestion of metals in surface soil only
  - Dermal contact of metals in surface soil only
  - Inhalation of metals in surface soil only
- Hypothetical Construction (adult only)
  - Ingestion of metals in both surface and subsurface soil
  - Dermal contact of metals in both surface and subsurface soil
  - Inhalation of metals in both surface and subsurface soil
  - Ingestion of metals in groundwater
  - Dermal contact of metals in groundwater

The basic exposure factors for the hypothetical future residential, commercial/industrial, and construction scenarios are presented in Table 1. Exposure to groundwater was added to the construction scenario per comments from DTSC. The toxicity values used in this updated HHRA are presented in Table 2.

The data used in this updated HHRA was obtained from two sources:

a) An updated evaluation of site metals data (the results of previous soil and groundwater sampling efforts at IWTP 360 as documented in the *Draft Final Amendment to Closure Summary Report*) versus background metals data (presented in Appendix B of the *Draft Final Amendment to Closure Summary Report*) that identified the Chemicals of Potential Concern (COPCs) for IWTP 360 and calculated their respective Exposure Point Concentrations (EPCs).

b) *Summary of Background Concentrations in Soil and Groundwater, Alameda Point* by TtEMI, dated December 2001, as recalculated by TtEMI in Tables 3.1 and 3.2 (a copy of this study and associated TtEMI tables are provided in Appendix B of this *Draft Final Amendment to Closure Summary Report*).

The COPCs used in this updated HHRA and their respective EPCs are presented in Table 3, along with the background metals values from the background study.

C3.0 SUMMARY OF CANCER AND NON-CANCER RISKS

Consistent with DTSC's recommended approach, the HHRA includes calculation of "site risk", "background risk", and "incremental risk". An estimate of "incremental risk" was obtained by subtracting out the background risk from the site risk. Table 4 summarizes the results of the updated HHRA, and the findings are discussed below.

C3.1 Site Risk

Calculated site cancer risk and non-cancer HI's for COPCs in soils and groundwater at the site for future hypothetical residential, commercial/ industrial, and construction land-use scenarios are shown in Table 4 and discussed below.

Future Residents

Surface Soils and Groundwater

As summarized in Table 4 and as calculated in Table 5 (site surface soil) and Table 7 (site groundwater), the site cancer risk for a hypothetical future resident associated with exposure to COPCs in site surface soils (0-1 foot bgs) and site groundwater combined is 3.35×10^{-3}, above USEPA's risk management range of 10^{-6} to 10^{-4} and DTSC's target cancer risk of 10^{-6} for residential land-use setting. Approximately 100 percent (%) of the site cancer risk is attributed to COPCs in groundwater, with approximately 100% of this cancer risk is attributed to exposure to groundwater via the ingestion pathway. The site cancer risk for a hypothetical future resident associated with COPCs in surface soils only is 1.13×10^{-8}, well below both the USEPA and DTSC criterias.

The site non-cancer HI for a resident child associated with exposure to COPCs in soils and groundwater combined is 7.52, which is above the USEPA and DTSC target HI of 1. Approximately 99% of the site non-cancer HI for a resident child is attributed to exposure to groundwater (i.e. non-cancer HI of 7.48), with approximately 99% of this via the ingestion pathway. The HI for a resident child associated with COPCs in surface soils only is 0.04, well below the USEPA and DTSC target HI of 1.

Subsurface Soils and Groundwater

The site cancer risks for a hypothetical future resident associated with exposure to COPCs in site subsurface soils (0-10 feet bgs) and site groundwater combined is 3.35×10^{-3}. Approximately 100% of the site cancer risk is attributed to exposure to groundwater, with approximately 100% of this risk attributed to exposure to groundwater via the ingestion pathway. The site cancer risk associated with COPCs in subsurface soils only is 6.8×10^{-5}, with approximately 100% of this risk attributed to arsenic.

The site non-cancer HI for a resident child associated with exposure to COPCs in soils and groundwater combined is 7.85. Approximately 95% of the site non-cancer HI for a resident child is attributed to exposure to groundwater (i.e. non-cancer HI of 7.48), with approximately 99% of this via the ingestion pathway. The HI for a resident child associated with COPCs in subsurface soils only is 0.37, below the USEPA and DTSC target HI of 1.

Future Commercial/Industrial Worker

Surface Soils
As summarized in Table 4 and calculated in Table 5 (site surface soils), the site cancer risks for a hypothetical future commercial/industrial worker associated with exposure to COPCs in surface soils is 3.71×10^{-9}, well below USEPA's risk management range of 10^{-6} to 10^{-4} and DTSCs target cancer risk of 10^{-5} for commercial land-use settings.

The site non-cancer HI for commercial/industrial worker associated with exposure to COPCs in surface soils is 0.003, well below the USEPA and DTSC target HI of 1.

Future Construction Worker

Surface Soils and Groundwater
As summarized in Table 4 and as calculated in Table 5 (site surface soil) and Table 7 (site groundwater), the site cancer risk for a hypothetical future construction worker associated with exposure to COPCs in surface soils and groundwater combined is 2.79×10^{-6}, well within USEPA's risk management range of 10^{-6} to 10^{-4} and below the target cancer risk of 10^{-5} typically used by DTSC for commercial land-use settings. Approximately 90% of this risk is attributed to ingestion of groundwater.

The site non-cancer HI for the construction worker associated with exposure to COPCs in soils and groundwater combined is 0.99, below the USEPA and DTSC target HI of 1. Approximately 91% of the site non-cancer HI for the construction worker is attributed to exposure to COPCs in surface soils via inhalation of particulates (fugitive dust).

The construction worker assumptions are based on exposure to high levels of dust generated from soil disturbance activities for 250 days at IWTP 360, and ingestion of 2 liters of groundwater each day for 10 days over the course of one year of site activities. IWTP 360 encompasses approximately a quarter of an acre area of soil (currently under pavement). Any future construction work generating high levels of dust at IWTP 360 is likely to result in a significantly shorter duration due to the small size of the area available for redevelopment activities. Additionally, construction below the water table is typically performed using heavy equipment, which would limit the direct exposure of groundwater to workers. Thus, the cancer risk from ingestion of groundwater and non-cancer HI for the inhalation of soil is likely a significant overestimate of potential risks associated with the site.

Subsurface Soils and Groundwater
As summarized in Table 4 and as calculated in Table 6 (site subsurface soil) and Table 7 (site groundwater), the site cancer risk for a hypothetical future construction worker associated with exposure to COPCs in subsurface soils and groundwater combined is 4.51 x 10^{-6}, well within USEPA's risk management range of 10^{-6} to 10^{-4} and below the target cancer risk of 10^{-5} typically used by DTSC for commercial land-use settings. Approximately 56% of this risk is attributed to the ingestion of site groundwater (containing arsenic). Approximately 44% of the risk is attributed to inhalation of site subsurface soils (with hexavalent chromium contributing nearly 94% of the risk from soil).

The non-cancer HI for the construction worker associated with exposure to COPCs in soils and groundwater combined is 0.62, below the USEPA and DTSC target HI of 1. Approximately 93% of the total non-cancer HI for the construction worker is attributed to exposure to COPCs in subsurface soils via the inhalation pathway.

As discussed previously, the calculated cancer risk for ingestion of groundwater and non-cancer HI for the inhalation of soil are likely overestimates of potential risks associated with site.

C3.2 Background Risk

Future Residents

As summarized in Table 4 and as calculated in Table 8 (background soil) and Table 9 (background groundwater), the cancer risk for a hypothetical future resident associated with exposure to metals (both COPCs and those considered consistent with background) at background concentrations in soils and groundwater at the site combined is 1.51 x 10^{-3}, above USEPA's risk management range of 10^{-6} to 10^{-4} and DTSC's target cancer risk of 10^{-6} for residential land-use setting. Approximately 93% of the total cancer risk is attributed to groundwater (i.e. cancer risk of 1.40 x 10^{-3}), with approximately 99% of this risk attributed to exposure via ingestion. The cancer risk associated with metals in soils is 1.04 x 10^{-4}, with 100% of this risk attributed to arsenic.

The non-cancer HI for a resident child associated with exposure to metals in soils and groundwater combined is 7.79, above the USEPA and DTSC target HI of 1. Approximately 89% of the total non-cancer HI for a resident child is attributed to exposure to groundwater (i.e. non-cancer HI of 6.94), with approximately 99% of this via the ingestion pathway. The HI for a resident child associated with metals in soils is 0.85, below the USEPA and DTSC target HI of 1.

Future Commercial/Industrial Worker

As summarized in Table 4 and as calculated in Table 8 (background soil), the cancer risk for a hypothetical future commercial/industrial worker associated with exposure to metals at background concentrations in soils at the site is 2.36 x 10^{-5}, within USEPA's risk management range of 10^{-6} to 10^{-4} and only slightly above DTSC's target cancer risk of 10^{-5} for commercial land-use setting. Approximately 90% of the cancer risk is attributed to exposure to arsenic via ingestion of soil.

The non-cancer HI for a commercial/industrial worker associated with exposure to metals at background concentrations in surface soils is 0.07, well below the USEPA and DTSC target HI of 1.

Future Construction Worker

As summarized in Table 4 and as calculated in Table 8 (background soil) and Table 9 (background groundwater), the cancer risk for a hypothetical future construction worker associated with exposure to metals present at background concentrations in soils and groundwater combined is 4.74 x 10^{-6}, within USEPA's risk management range of 10^{-6} to 10^{-4} and below DTSC's target cancer risk of 10^{-5} for commercial land-use setting. Approximately 78% of the cancer risk is attributed to exposure to arsenic via ingestion of soil, while 22% of the cancer risk is attributed to ingestion of groundwater.

The non-cancer HI for a commercial/industrial worker associated with exposure to metals at background concentrations in soils and groundwater combined is 2.82, above the USEPA and DTSC target HI of 1, with 97% of the HI from the inhalation of soils containing aluminum, arsenic, cobalt, manganese, and nickel.

C3.3 Incremental Risk

Incremental risk posed by the site in excess of background risk has be estimated by subtracting background risk from the risk posed by the COPCs at the site, as shown in Table 4.

This is a reasonable approach in estimating the incremental risk posed by the COPCs at the site, as the EPCs for both the site results and the background study used similar statistical methodology (estimating the values using upper confidence limit methodology and employing the same software estimating tools [ProUCL] and other methodology) in developing their respective EPCs.

The estimated combined incremental risks and incremental non-cancer HI's are calculated for the full exposure scenarios (e.g., using the combined background risk for soil and groundwater from the combined site risk for soil and groundwater), rather than the individual media. Estimated incremental risks and incremental non-cancer HI's were also calculated for each media, for reference. However, note the estimated media-specific incremental risks and incremental non-cancer HI's do not directly add up to the estimated combined incremental risks and incremental non-cancer HI's.

Future Residents

Surface Soils and Groundwater

As shown in Table 4, the incremental cancer risk for a hypothetical future resident associated with exposure to COPCs in surface soils and groundwater combined at the site is 1.84×10^{-3}, above USEPA's risk management range of 10^{-6} to 10^{-4} and DTSC's target cancer risk of 10^{-6} for residential land-use setting. However, the incremental cancer risk is attributed entirely to the ingestion pathway for arsenic in groundwater. For soils, the calculated risk from metals at background concentrations is significantly higher than the risk calculated for the COPCs at site concentrations, resulting in no estimated incremental risk from the site surface soils.

There is an estimated incremental non-cancer HI for a resident adult of 0.14, with no estimated incremental no-cancer HI for resident child.

Subsurface Soils and Groundwater

As shown in Table 4, the incremental cancer risk for a hypothetical future resident associated with exposure to COPCs in subsurface soils and groundwater combined at the site is 1.84×10^{-3}. However, the incremental cancer risk is attributed entirely to the ingestion pathway for arsenic in groundwater. For soils, the calculated risk from metals at background concentrations is significantly higher than the risk calculated for the COPCs at site concentrations, resulting in no calculated incremental risk from the site subsurface soils.

There is an estimated incremental non-cancer HI for a resident adult of 0.15, with no estimated incremental no-cancer HI for resident child.

Future Commercial/Industrial Worker

As shown in Table 4, there is no estimated incremental risk or incremental non-cancer HI for a hypothetical future commercial/industrial worker from exposure to COPCs in surface soils at the site.

Future Construction Worker

As shown in Table 4, there is no estimated incremental risk or incremental non-cancer HI for a hypothetical future construction worker from exposure to COPCs in either surface or subsurface soils and groundwater.

C4.0 HEALTH EFFECTS FROM EXPOSURE TO LEAD

Lead was selected as a COPC for soil was evaluated using the LeadSpread model (DTSC, 2003). The EPC for lead in the surface soil was 5 mg/kg, and subsurface soil was 23.4 mg/kg. Lead was considered to be within background in groundwater (see Appendix B), with a background concentration in groundwater of 2.4 ug/L.

The model predicts that the 95 percent estimate of blood lead is 1.6 micrograms per deciliter (µg/dL) for a child ingesting site surface soil and background groundwater, compared to the comparison criterion of 10 µg/dL (see Attachment 1). The model predicts that the 95 percent estimate of blood lead is 2.1 µg/dL for a child ingesting site subsurface soil and background groundwater. Based on LeadSpread results, there is no potential risk to human health from ingestion of lead in IWTP 360 soil and groundwater.

C5.0 CONCLUSION

Future Residents

Based on both the site cancer risk and non-cancer HI, and estimated incremental cancer risk and non-cancer HI, for both surface and subsurface soils, COPCs in soils pose no significant cancer risk or non-cancer hazard to the hypothetical future residential population. Based on the incremental cancer risk and non-cancer HI for groundwater, COPCs in groundwater could pose a significant hazard to a hypothetical future resident who consumes water directly from the shallow groundwater aquifer. However, the shallow aquifer at IWTP 360 is unlikely to be used as a potable water source in the future due to other contaminants in groundwater associated with CERCLA IR Site 3 Group, which encompasses IWTP 360. Thus, potential future exposure to

COPCs in shallow groundwater associated with IWTP 360 by the hypothetical future residential population is unlikely to occur, and thus the calculated cancer risk and non-cancer HI for COPCs in groundwater at IWTP 360 represent an overestimation of the potential health hazard for the hypothetical future residential population.

The planned reuse for the area around IWTP 360 is commercial/industrial, and is characterized by a combination of industrial, open space, and community support uses (EDAN, 1996).

Future Commercial/Industrial Worker

As suggested by the very low site cancer risk and negligible non-cancer HI indicated above, estimates suggest no incremental cancer risk and non-cancer HI to the hypothetical future commercial/industrial worker. Thus, COPCs in surface soils at the site pose no significant cancer risk or non-cancer hazard to the hypothetical future commercial population.

Future Construction Worker

The site cancer risk for hypothetical future construction worker exposed to surface soils and groundwater, and subsurface soils and groundwater, at the site are within USEPA's risk management range of 10^{-6} to 10^{-4} and below the target cancer risk of 10^{-5} typically used by DTSC for commercial land-use settings. Site non-cancer HI for both surface soils and groundwater, and subsurface soils and groundwater scenarios, are below USEPA's and DTSC's target HI of 1.

The site cancer risk and non-cancer HI values, which are within the USEPA's risk management range and DTSC target cancer risk for commercial land-use settings, are likely a significant overestimate of potential risks posed by the site.

The construction worker scenario includes conservative assumptions based on exposure to high levels of dust generated from soil disturbance activities for 250 days at IWTP 360 and ingestion of 2 liters of groundwater each day for 10 days during one year. IWTP 360 encompasses approximately a quarter of an acre area of soil (currently under pavement). Any future construction work generating high levels of dust at IWTP 360 is likely to result in a significantly shorter duration due to the small size of the area available for redevelopment activities. Additionally, construction below the water table is typically performed using heavy equipment, which would limit the direct exposure of groundwater to workers. Thus, the cancer risk from ingestion of groundwater and non-cancer HI for the inhalation of soil is likely a significant overestimate of potential risks associated with the site.

Estimates suggest there is no incremental cancer risk or non-cancer HI for the hypothetical future construction worker posed by COPCs in either surface of subsurface and groundwater scenarios. Thus, COPCs in soils and groundwater at the site would not pose a significant cancer risk to the hypothetical future construction worker.

C6.0 REFERENCES

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Table 1: Exposure Factors

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Exposure Pathways for Soil		Exposure Scenario		
		Residential	Commercial/ Industrial	Construction Worker
A. Ingestion of Chemicals in Soil				
Concentration (CS)	mg/kg	Chemical Specific	Chemical Specific	Chemical Specific
Ingestion Rate (IRa)	kg/day	0.0001	0.0001	0.00033
Ingestion Rate (IRc)	kg/day	0.0002	NA	NA
Exposure Frequency (EF)	days/year	350	250	250
Exposure Duration (EDa)	years	24	25	1
Exposure Duration (EDc)	years	6	NA	NA
Body Weight (BWa)	kg	70	70	70
Body Weight (BWc)	kg	15	NA	NA
Carcinogenic Averaging Time (AT)	days	25550	25550	25550
Non-carcinogenic Averaging Time (ATa)	days	8760	9125	365
Non-carcinogenic Averaging Time (ATc)	days	2190	NA	NA
B. Dermal Contact of Chemicals in Soil				
Concentration (CS)	mg/kg	Chemical Specific	Chemical Specific	Chemical Specific
Total Skin Surface Area (SAa)	m2/day	0.57	0.57	0.57
Total Skin Surface Area (SAc)	m2/day	0.29	NA	NA
Soil to Skin Adherence Factor (AFa)	mg/cm2	0.07	0.2	0.8
Soil to Skin Adherence Factor (AFc)	mg/cm2	0.2	NA	NA
Absorption Factor (ABS) (inorganics)	unitless	0.01	0.01	0.01
Exposure Frequency (EF)	days	350	250	250
Exposure Duration (EDa)	years	24	25	1
Exposure Duration (EDc)	years	6	NA	NA
Body Weight (BWa)	kg	70	70	70
Body Weight (BWc)	kg	15	NA	NA
Carcinogenic Averaging Time (AT)	days	25550	25550	25550
Non-carcinogenic Averaging Time (ATa)	days	8760	9125	365
Non-carcinogenic Averaging Time (ATc)	days	2190	NA	NA
C. Inhalation of Chemicals in Soil				
Concentration (CS)	mg/kg	Chemical Specific	Chemical Specific	Chemical Specific
PEF (Residential/Commercial)	m3/kg	1.32E+09	1.32E+09	1.00E+06
Concentration (CS)	mg/m3	PEF/CS	PEF/CS	PEF/CS
Inhalation Rate (IRa)	m3/hr	0.83	1.75	2.5
Inhalation Rate (IRc)	m3/hr	0.42	NA	NA
Exposure Time (ET)	hrs/day	24	8	8
Exposure Frequency (EF)	days/yr	350	250	250
Exposure Duration (EDa)	years	24	25	1
Exposure Duration (EDc)	years	6	NA	NA
Body Weight (BWa)	kg	70	70	70
Body Weight (BWc)	kg	15	NA	NA
Carcinogenic Averaging Time (AT)	days	25550	25550	25550
Non-carcinogenic Averaging Time (ATa)	days	8760	9125	365
Non-carcinogenic Averaging Time (ATc)	days	2190	NA	NA

Table 1: Exposure Factors

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Exposure Pathways for Groundwater		Exposure Scenario		
		Residential	Commercial/ Industrial	Construction Worker
A. Ingestion of Chemicals from Groundwater				
Concentration (CS)	mg/L	Chemical Specific	Chemical Specific	Chemical Specific
Ingestion Rate (IRa)	L/day	2	NA	2
Ingestion Rate (IRc)	L/day	1	NA	NA
Exposure Frequency (EF)	days/year	350	NA	10
Exposure Duration (EDa)	years	24	NA	1
Exposure Duration (EDc)	years	6	NA	NA
Body Weight (BWa)	kg	70	NA	70
Body Weight (BWc)	kg	15	NA	NA
Carcinogenic Averaging Time (AT)	days	25550	NA	25550
Non-carcinogenic Averaging Time (ATa)	days	8760	NA	365
Non-carcinogenic Averaging Time (ATa)	days	2190	NA	NA
B. Dermal Contact from Chemicals in Groundwater				
Concentration (CS)	mg/L	Chemical Specific	Chemical Specific	Chemical Specific
Skin Surface Area (SAa)	cm2	18000	NA	5700
Skin Surface Area (SAc)	cm2	6600	NA	NA
Volume Conversion Factor	L/cm3	0.001	NA	0.001
Permeability Constant (Kp)	cm/hr	0.001	NA	0.001
Exposure Time (ETa)	hrs/day	0.58	NA	1
Exposure Time (ETc)	hrs/day	1	NA	NA
Exposure Frequency (EF)	days	350	NA	10
Exposure Duration (EDa)	years	24	NA	1
Exposure Duration (EDc)	years	6	NA	NA
Body Weight (BWa)	kg	70	NA	70
Body Weight (BWc)	kg	15	NA	NA
Carcinogenic Averaging Time (AT)	days	25550	NA	25550
Non-carcinogenic Averaging Time (ATa)	days	8760	NA	365
Non-carcinogenic Averaging Time (ATc)	days	2190	NA	NA

Table 2: Toxicity Factors

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Chemical	Cancer Slope Factor (CSF) $(mg/kg\text{-}day)^{-1}$				Chronic Noncancer Reference Dose (RfD) (mg/kg-day)			
	Inhalation	Source	Oral	Source	Inhalation	Source	Oral	Source
Aluminum	NC	1	NC	1	1.4E-03	3	1.0E+00	3
Arsenic	1.2E+01	2	9.5E+00	2	8.6E-06	2d	3.0E-04	1
Barium	NC	1	NC	1	1.4E-04	4	2.0E-01	1
Beryllium	8.4E+00	2	NC	2a	2.0E-06	2d	2.0E-03	1
Cadmium	1.5E+01	2	NC	a,b	5.7E-06	2d	5.0E-04	1e, f
Chromium (3+)	NC	1	NC	1	NA	1	1.5E+00	1
Chromium VI	5.1E+02	2	NC	1a	5.7E-05	2d	3.0E-03	1
Cobalt	9.8E+00	3	NC	1a	5.7E-06	3	2.0E-02	3
Copper	NC	1	NC	1	NA	1	4.0E-02	4g
Lead	NA	c	NA	c	NA	c	NA	c
Manganese	NC	1	NC	1	5.7E-05	2d	2.4E-02	5h
Mercury	NC	1	NC	1	2.6E-05	2d	3.0E-04	1i
Molybdenum	NC	1	NC	1	NA	1	5.0E-03	1
Nickel	9.1E-01	2	NC	2a	1.4E-05	2d	2.0E-02	1j
Selenium	NC	1	NC	1	NA	1	5.0E-03	1
Silver	NC	1	NC	1	NA	1	5.0E-03	1
Thallium	NC	1	NC	1	NA	1	6.6E-05	5h
Titanium	NC	1	NC	1	NA	1	NA	1
Vanadium	NC	1	NC	1	NA	1	1.0E-03	6
Zinc	NC	1	NC	1	NA	1	3.0E-01	1

Notes:

NA - Not available. Route-specific toxicity value for this compound was not available.

NC - Not considered to be a carcinogen.

a. This chemical is not considered a carcinogen by the route of ingestion.

b. Reflects DTSC's current position that cadmium is not considered carcinogenic via the oral route.

c. Lead exposure is evaluated using Cal/EPA's LEADSPREAD Model.

d. This value was converted from an OEHHA REL (in ug chemical/m3 air), assuming a 20 m3/day inhalation rate and 70 kg body weight with a 0.001 unit conversion from ug to mg. This conversion was applied to:

Chemical	OEHHA Chronic REL (ug/m^3)	Inhalation RfD
Arsenic	0.03	8.6E-06
Beryllium	0.007	2.0E-06
Cadmium	0.02	5.7E-06
Chromium VI	0.2	5.7E-05
Manganese	0.2	5.7E-05
Mercury	0.09	2.6E-05
Nickel	0.05	1.4E-05

$$RfDi = \frac{RELc \times (0.001\ mg/ug) \times (20\ m3/day)}{(70\ kg)}$$

e. The RfD for cadmium is estimated for cadmium exposure in water.

f. A RfD for dermal exposure route of 2.5 x 10-5 mg/kg-day used in hazard index calculations as cited in the USEPA Region XI PRG User Guide (i.e. derived from the oral RfD).

g. The RfD for copper is based on a drinking water standard of 1.3 mg/L, converted to dose assuming a 2 liters/day ingestion rate and 70 kg body weight (i.e. 1.3 mg/L x 2 L/day / 70 kg = 0.04 mg/kd-day).

h. Value cited in USEPA Region IX PRG table derived from toxicity values cited in IRIS database.

i. Toxicity value for mercuric chloride.

j. Toxicity value for nickel, soluble salts.

Sources:

1. USEPA 2006. Integrated Risk Information System (IRIS) Database. http://www.epa.gov/iris/index.html.
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Table 3: Chemicals of Potential Concern and Background Metals Values

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Site Surface Soils (0-1 Foot)		Site Subsurface Soils (0-10 Feet)		Groundwater	
COPC[(1)]	EPC[(1)] (mg/kg)	COPC[(1)]	EPC[(1)] (mg/kg)	COPC[(1)]	EPC[(1)] (mg/L)
Barium	5.95E+01	Barium	3.35E+01	Arsenic	2.35E-02
—		Calcium	3.91E+03	Calcium	7.46E+01
Chromium	3.42E+01	Chromium	6.16E+01	Chromium	6.83E-02
—		Chromium VI	1.32E+00	Chromium VI	2.00E-02
Cobalt	6.22E+00	Cobalt	2.06E+00	Nickel	2.84E-02
Lead	5.00E+00	Lead	2.34E+01	Vanadium	2.96E-02
—		Molybdenum	5.10E+00	Zinc	2.27E-02
Nickel	4.26E+01	Nickel	2.76E+01		
—		Silver	1.05E+01		

"Blue Background" Soil		Background Groundwater	
Metal	EPC[(2)] (mg/kg)	Metal	EPC[(2)] (mg/L)
Aluminum	7.07E+03	Aluminum	4.02E-01
Arsenic	6.39E+00	Arsenic	9.88E-03
Barium	6.33E+01	Barium	1.85E-01
Beryllium	4.95E-01	Cadmium	1.29E-03
Cadmium	4.95E-01	Chromium	5.61E-03
Chromium	3.57E+01	Cr VI	4.00E-03
Cobalt	6.45E+00	Lead	2.39E-03
Copper	1.52E+01	Manganese	1.37E+00
Lead	7.54E+00	Molybdenum	6.41E-03
Manganese	1.60E+02	Nickel	1.27E-02
Nickel	3.16E+01	Vanadium	1.03E-02
Silver	1.88E+00		
Vanadium	2.37E+01		
Zinc	3.09E+01		

(1) COPCs and EPCs from Table 1 (Soil) and Table 2 (Groundwater), Appendix B, Site Data Versus Background Data Evaluation.
(2) Background metals and EPCs from Summary of Background Concentrations in Soil and Groundwater, Alameda Point, Alameda, California as re-calculated by TtEMI in Tables 3.1 and 3.2.

Table 4: Summary of Risks and Hazard Indices

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Scenario	Metals Contributing to Site Risk or HI[1]	Calculated Site Risk (using COPCs only)			Calculated Background Risk (using background data)			Estimated Incremental Risk (site risk minus background risk)		
		Risk	HI		Risk	HI		Risk	HI	
		Combined	*Adult*	*Child*	*Combined*	*Adult*	*Child*	*Combined*	*Adult*	*Child*
Future Residential										
Surface Soils	—	1.13E-08	0.005	0.04	1.04E-04	0.09	0.85	None	None	None
Groundwater	As	3.35E-03	3.20	7.48	1.40E-03	2.97	6.94	1.94E-03	0.23	0.54
Surface Soils and Groundwater	As	3.35E-03	3.21	7.52	1.51E-03	3.06	7.79	1.84E-03	0.14	None
Subsurface Soils	—	8.09E-08	0.01	0.07	1.04E-04	0.09	0.85	None	None	None
Groundwater	As	3.35E-03	3.20	7.48	1.40E-03	2.97	6.94	1.94E-03	0.23	0.54
Subsurface Soils and Groundwater	As	3.35E-03	3.21	7.55	1.51E-03	3.06	7.79	1.84E-03	0.15	None
Future Commercial/Industrial										
Surface Soils	—	3.71E-09	0.003	NA	2.36E-05	0.07	NA	None	None	NA
Surface Soils Only		3.71E-09	0.003	NA	2.36E-05	0.07	NA	None	None	NA
Future Construction Worker										
Surface Soils	—	2.79E-07	0.90	NA	3.69E-06	2.74	NA	None	None	NA
Groundwater	As	2.51E-06	0.09	NA	1.05E-06	0.08	NA	1.46E-06	0.01	NA
Surface Soils and Groundwater	As	2.79E-06	0.99	NA	4.74E-06	2.82	NA	None	None	NA
Subsurface Soils	—	2.00E-06	0.53	NA	3.69E-06	2.74	NA	None	None	NA
Groundwater	As	2.51E-06	0.09	NA	1.05E-06	0.08	NA	1.46E-06	0.01	NA
Subsurface Soils and Groundwater	As	4.51E-06	0.62	NA	4.74E-06	2.82	NA	None	None	NA

(1) A metal is considered contributing to the risk or HI if the individually calculated risk is greater than or equal to 1.0E-06 or HI greater than 1.

Table 5: Risk and Hazard Index Calculations for Site Surface Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Residential Exposure Scenario

-Site Surface Soils (0-1 ft)	COPC EPC (mg/kg)	Barium 5.95E+01	Chromium 3.42E+01	Cobalt 6.22E+00	Nickel 4.26E+01
Ingestion of Soil					
Slope Factor-Oral		NA	NA	NA	NA
RfD-Oral		2.00E-01	1.50E+00	2.00E-02	2.00E-02
Carcinogenic CDI		9.31E-05	5.36E-05	9.74E-06	6.67E-05
Non-carcinogenic CDI-Adult		8.15E-05	4.69E-05	8.53E-06	5.84E-05
Non-carcinogenic CDI-Child		7.60E-04	4.38E-04	7.96E-05	5.45E-04
Carcinogenic Risk	NA	NA	NA	NA	NA
Hazard Index-Adult	3.78E-03	4.07E-04	3.13E-05	4.26E-04	2.92E-03
Hazard Index-Child	3.53E-02	3.80E-03	2.92E-04	3.98E-03	2.72E-02
Dermal Contact with Soil					
Slope Factor-Dermal		NA	NA	NA	NA
RfD-Dermal		2.00E-01	1.50E+00	2.00E-02	2.00E-02
Carcinogenic CDI		3.00E-06	1.73E-06	3.14E-07	2.15E-06
Non-carcinogenic CDI-Adult		3.25E-06	1.87E-06	3.40E-07	2.33E-06
Non-carcinogenic CDI-Child		2.21E-05	1.27E-05	2.31E-06	1.58E-05
Carcinogenic Risk	NA	NA	NA	NA	NA
Hazard Index-Adult	1.51E-04	1.63E-05	1.25E-06	1.70E-05	1.16E-04
Hazard Index-Child	1.02E-03	1.10E-04	8.46E-06	1.15E-04	7.90E-04
Inhalation of Particulate Soil					
Slope Factor-Inhalation		NA	NA	9.80E+00	9.10E-01
RfD-Inhalation		1.40E-04	NA	5.70E-06	1.40E-05
PEF	m3/kg	1.32E+09	1.32E+09	1.32E+09	1.32E+09
Concentration	mg/m3	4.52E-08	2.60E-08	4.73E-09	3.24E-08
Carcinogenic CDI		6.72E-09	3.87E-09	7.04E-10	4.82E-09
Non-carcinogenic CDI-Adult		1.23E-08	7.10E-09	1.29E-09	8.84E-09
Non-carcinogenic CDI-Child		2.91E-08	1.68E-08	3.05E-09	2.09E-08
Carcinogenic Risk	1.13E-08	NA	NA	6.90E-09	4.38E-09
Hazard Index-Adult	9.46E-04	8.81E-05	NA	2.26E-04	6.31E-04
Hazard Index-Child	2.23E-03	2.08E-04	NA	5.35E-04	1.49E-03
Total Carcinogenic Risk	**1.13E-08**	NA	NA	6.90E-09	4.38E-09
Total Hazard Index-Adult	**4.88E-03**	5.12E-04	3.25E-05	6.70E-04	3.67E-03
Total Hazard Index-Child	**3.86E-02**	4.12E-03	3.00E-04	4.63E-03	2.95E-02

Table 5: Risk and Hazard Index Calculations for Site Surface Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Commercial/Industrial Exposure Scenario

-Site Surface Soils (0-1 ft)	COPC	Barium	Chromium	Cobalt	Nickel
	EPC (mg/kg)	5.95E+01	3.42E+01	6.22E+00	4.26E+01
Ingestion of Soil					
Slope Factor-Oral		NA	NA	NA	NA
RfD-Oral		2.00E-01	1.50E+00	2.00E-02	2.00E-02
Carcinogenic CDI		2.08E-05	1.20E-05	2.17E-06	1.49E-05
Non-carcinogenic CDI-Adult		5.82E-05	3.35E-05	6.09E-06	4.17E-05
Carcinogenic Risk	NA	NA	NA	NA	NA
Hazard Index-Adult	2.70E-03	2.91E-04	2.23E-05	3.04E-04	2.08E-03
Dermal Contact with Soil					
Slope Factor-Dermal		NA	NA	NA	NA
RfD-Dermal		2.00E-01	1.50E+00	2.00E-02	2.00E-02
Carcinogenic CDI		2.37E-06	1.36E-06	2.48E-07	1.70E-06
Non-carcinogenic CDI-Adult		6.63E-06	3.82E-06	6.94E-07	4.75E-06
Carcinogenic Risk	NA	NA	NA	NA	NA
Hazard Index-Adult	3.08E-04	3.32E-05	2.54E-06	3.47E-05	2.38E-04
Inhalation of Particulate Soil					
Slope Factor-Inhalation		NA	NA	9.80E+00	9.10E-01
RfD-Inhalation		1.40E-04	NA	5.70E-06	1.40E-05
PEF	m3/kg	1.32E+09	1.32E+09	1.32E+09	1.32E+09
Concentration	mg/m3	4.52E-08	2.60E-08	4.73E-09	3.24E-08
Carcinogenic CDI		2.21E-09	1.27E-09	2.31E-10	1.58E-09
Non-carcinogenic CDI-Adult		6.19E-09	3.56E-09	6.48E-10	4.44E-09
Carcinogenic Risk	3.71E-09	NA	NA	2.27E-09	1.44E-09
Hazard Index-Adult	4.75E-04	4.42E-05	NA	1.14E-04	3.17E-04
Total Carcinogenic Risk	**3.71E-09**	NA	NA	2.27E-09	1.44E-09
Total Hazard Index-Adult	**3.49E-03**	3.68E-04	2.49E-05	4.53E-04	2.64E-03

Table 5: Risk and Hazard Index Calculations for Site Surface Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Construction Worker Exposure Scenario

-Site Surface Soils (0-1 ft)	COPC EPC (mg/kg)	Barium 5.95E+01	Chromium 3.42E+01	Cobalt 6.22E+00	Nickel 4.26E+01
Ingestion of Soil					
Slope Factor-Oral		NA	NA	NA	NA
RfD-Oral		2.00E-01	1.50E+00	2.00E-02	2.00E-02
Carcinogenic CDI		2.74E-06	1.58E-06	2.87E-07	1.97E-06
Non-carcinogenic CDI-Adult		1.92E-04	1.10E-04	2.01E-05	1.38E-04
Carcinogenic Risk	NA	NA	NA	NA	NA
Hazard Index-Adult	8.92E-03	9.60E-04	7.37E-05	1.00E-03	6.88E-03
Dermal Contact with Soil					
Slope Factor-Dermal		NA	NA	NA	NA
RfD-Dermal		2.00E-01	1.50E+00	2.00E-02	2.00E-02
Carcinogenic CDI		3.79E-07	2.18E-07	3.97E-08	2.72E-07
Non-carcinogenic CDI-Adult		2.65E-05	1.53E-05	2.78E-06	1.90E-05
Carcinogenic Risk	NA	NA	NA	NA	NA
Hazard Index-Adult	1.23E-03	1.33E-04	1.02E-05	1.39E-04	9.51E-04
Inhalation of Particulate Soil					
Slope Factor-Inhalation		NA	NA	9.80E+00	9.10E-01
RfD-Inhalation		1.40E-04	NA	5.70E-06	1.40E-05
PEF	m3/kg	1.00E+06	1.00E+06	1.00E+06	1.00E+06
Concentration	mg/m3	5.95E-05	3.42E-05	6.22E-06	4.26E-05
Carcinogenic CDI		1.66E-07	9.57E-08	1.74E-08	1.19E-07
Non-carcinogenic CDI-Adult		1.16E-05	6.70E-06	1.22E-06	8.34E-06
Carcinogenic Risk	2.79E-07	NA	NA	1.71E-07	1.08E-07
Hazard Index-Adult	8.92E-01	8.31E-02	NA	2.14E-01	5.96E-01
Total Carcinogenic Risk	**2.79E-07**	NA	NA	1.71E-07	1.08E-07
Total Hazard Index-Adult	**9.03E-01**	8.42E-02	8.38E-05	2.15E-01	6.03E-01

Table 6: Risk and Hazard Index Calculations for Site Subsurface Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Residential Exposure Scenario -Site Subsurface Soils (0-10 ft)	COPC EPC (mg/kg)	Barium 3.35E+01	Chromium 6.16E+01	Cr VI 1.32E+00	Cobalt 2.06E+00	Molybdenum 5.10E+00	Nickel 2.76E+01	Silver 1.05E+01
Ingestion of Soil								
Slope Factor-Oral		NA	NA	NA	NA	NA	NA	NA
RfD-Oral		2.00E-01	1.50E+00	3.00E-03	2.00E-02	5.00E-03	2.00E-02	5.00E-03
Carcinogenic CDI		5.24E-05	9.65E-05	2.06E-06	3.22E-06	7.98E-06	4.33E-05	1.64E-05
Non-carcinogenic CDI-Adult		4.58E-05	8.44E-05	1.80E-06	2.82E-06	6.99E-06	3.79E-05	1.44E-05
Non-carcinogenic CDI-Child		4.28E-04	7.88E-04	1.68E-05	2.63E-05	6.52E-05	3.53E-04	1.34E-04
Carcinogenic Risk	NA	NA	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	7.19E-03	2.29E-04	5.63E-05	6.00E-04	1.41E-04	1.40E-03	1.89E-03	2.87E-03
Hazard Index-Child	6.71E-02	2.14E-03	5.25E-04	5.60E-03	1.31E-03	1.30E-02	1.77E-02	2.68E-02
Dermal Contact with Soil								
Slope Factor-Dermal		NA	NA	NA	NA	NA	NA	NA
RfD-Dermal		2.00E-01	1.50E+00	3.00E-03	2.00E-02	5.00E-03	2.00E-02	5.00E-03
Carcinogenic CDI		1.69E-06	3.11E-06	6.64E-08	1.04E-07	2.58E-07	1.40E-06	5.29E-07
Non-carcinogenic CDI-Adult		1.83E-06	3.37E-06	7.19E-08	1.12E-07	2.79E-07	1.51E-06	5.73E-07
Non-carcinogenic CDI-Child		1.24E-05	2.28E-05	4.88E-07	7.62E-07	1.89E-06	1.02E-05	3.89E-06
Carcinogenic Risk	NA	NA	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	2.87E-04	9.14E-06	2.25E-06	2.40E-05	5.62E-06	5.58E-05	7.55E-05	1.15E-04
Hazard Index-Child	1.95E-03	6.20E-05	1.52E-05	1.63E-04	3.81E-05	3.78E-04	5.12E-04	7.77E-04
Inhalation of Particulate Soil								
Slope Factor-Inhalation		NA	NA	5.10E+02	9.80E+00	NA	9.10E-01	NA
RfD-Inhalation		1.40E-04	NA	5.70E-05	5.70E-06	NA	1.40E-05	NA
Carcinogenic CDI		3.78E-09	6.97E-09	1.49E-10	2.32E-10	5.77E-10	3.13E-09	1.18E-09
Non-carcinogenic CDI-Adult		6.94E-09	1.28E-08	2.73E-10	4.26E-10	1.06E-09	5.73E-09	2.17E-09
Non-carcinogenic CDI-Child		1.64E-08	3.02E-08	6.44E-10	1.01E-09	2.50E-09	1.35E-08	5.13E-09
Carcinogenic Risk	8.09E-08	NA	NA	7.58E-08	2.28E-09	NA	2.84E-09	NA
Hazard Index-Adult	5.39E-04	4.96E-05	NA	4.78E-06	7.48E-05	NA	4.09E-04	NA
Hazard Index-Child	1.27E-03	1.17E-04	NA	1.13E-05	1.77E-04	NA	9.67E-04	NA
Total Carcinogenic Risk	**8.09E-08**	NA	NA	7.58E-08	2.28E-09	NA	2.84E-09	NA
Total Hazard Index-Adult	**8.01E-03**	2.88E-04	5.85E-05	6.29E-04	2.21E-04	1.45E-03	2.38E-03	2.99E-03
Total Hazard Index-Child	**7.03E-02**	2.32E-03	5.40E-04	5.78E-03	1.53E-03	1.34E-02	1.92E-02	2.76E-02

Table 6: Risk and Hazard Index Calculations for Site Subsurface Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Commercial/Industrial Exposure Scenario

-Site Subsurface Soils (0-10 ft)	COPC EPC (mg/kg)	Barium 3.35E+01	Chromium 6.16E+01	Cr VI 1.32E+00	Cobalt 2.06E+00	Molybdenum 5.10E+00	Nickel 2.76E+01	Silver 1.05E+01
Ingestion of Soil								
Slope Factor-Oral		NA	NA	NA	NA	NA	NA	NA
RfD-Oral		2.00E-01	1.50E+00	3.00E-03	2.00E-02	5.00E-03	2.00E-02	5.00E-03
Carcinogenic CDI		1.17E-05	2.15E-05	4.60E-07	7.18E-07	1.78E-06	9.66E-06	3.66E-06
Non-carcinogenic CDI-Adult		3.27E-05	6.03E-05	1.29E-06	2.01E-06	4.99E-06	2.70E-05	1.03E-05
Carcinogenic Risk	NA	NA	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	5.13E-03	1.64E-04	4.02E-05	4.29E-04	1.01E-04	9.98E-04	1.35E-03	2.05E-03
Dermal Contact with Soil								
Slope Factor-Dermal		NA	NA	NA	NA	NA	NA	NA
RfD-Dermal		2.00E-01	1.50E+00	3.00E-03	2.00E-02	5.00E-03	2.00E-02	5.00E-03
Carcinogenic CDI		1.33E-06	2.45E-06	5.24E-08	8.19E-08	2.03E-07	1.10E-06	4.17E-07
Non-carcinogenic CDI-Adult		3.73E-06	6.87E-06	1.47E-07	2.29E-07	5.69E-07	3.08E-06	1.17E-06
Carcinogenic Risk	NA	NA	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	5.85E-04	1.87E-05	4.58E-06	4.89E-05	1.15E-05	1.14E-04	1.54E-04	2.34E-04
Inhalation of Particulate Soil								
Slope Factor-Inhalation		NA	NA	5.10E+02	9.80E+00	NA	9.10E-01	NA
RfD-Inhalation		1.40E-04	NA	5.70E-05	5.70E-06	NA	1.40E-05	NA
Carcinogenic CDI		1.24E-09	2.29E-09	4.89E-11	7.64E-11	1.90E-10	1.03E-09	3.90E-10
Non-carcinogenic CDI-Adult		3.48E-09	6.41E-09	1.37E-10	2.14E-10	5.31E-10	2.88E-09	1.09E-09
Carcinogenic Risk	2.66E-08	NA	NA	2.49E-08	7.49E-10	NA	9.35E-10	NA
Hazard Index-Adult	2.70E-04	2.49E-05	NA	2.40E-06	3.75E-05	NA	2.06E-04	NA
Total Carcinogenic Risk	**2.66E-08**	NA	NA	2.49E-08	7.49E-10	NA	9.35E-10	NA
Total Hazard Index-Adult	**5.99E-03**	2.07E-04	4.48E-05	4.80E-04	1.50E-04	1.11E-03	1.71E-03	2.28E-03

Table 6: Risk and Hazard Index Calculations for Site Subsurface Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Construction Worker Exposure Scenario

-Site Subsurface Soils (0-10 ft)	COPC EPC (mg/kg)	Barium 3.35E+01	Chromium 6.16E+01	Cr VI 1.32E+00	Cobalt 2.06E+00	Molybdenum 5.10E+00	Nickel 2.76E+01	Silver 1.05E+01
Ingestion of Soil								
Slope Factor-Oral		NA	NA	NA	NA	NA	NA	NA
RfD-Oral		2.00E-01	1.50E+00	3.00E-03	2.00E-02	5.00E-03	2.00E-02	5.00E-03
Carcinogenic CDI		1.54E-06	2.84E-06	6.07E-08	9.48E-08	2.35E-07	1.28E-06	4.83E-07
Non-carcinogenic CDI-Adult		1.08E-04	1.99E-04	4.25E-06	6.64E-06	1.65E-05	8.93E-05	3.38E-05
Carcinogenic Risk	NA	NA	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	1.69E-02	5.40E-04	1.33E-04	1.42E-03	3.32E-04	3.29E-03	4.46E-03	6.77E-03
Dermal Contact with Soil								
Slope Factor-Dermal		NA	NA	NA	NA	NA	NA	NA
RfD-Dermal		2.00E-01	1.50E+00	3.00E-03	2.00E-02	5.00E-03	2.00E-02	5.00E-03
Carcinogenic CDI		2.13E-07	3.93E-07	8.38E-09	1.31E-08	3.25E-08	1.76E-07	6.68E-08
Non-carcinogenic CDI-Adult		1.49E-05	2.75E-05	5.87E-07	9.17E-07	2.28E-06	1.23E-05	4.68E-06
Carcinogenic Risk	NA	NA	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	2.34E-03	7.46E-05	1.83E-05	1.96E-04	4.59E-05	4.55E-04	6.17E-04	9.35E-04
Inhalation of Particulate Soil								
Slope Factor-Inhalation		NA	NA	5.10E+02	9.80E+00	NA	9.10E-01	NA
RfD-Inhalation		1.40E-04	NA	5.70E-05	5.70E-06	NA	1.40E-05	NA
Carcinogenic CDI		9.35E-08	1.72E-07	3.68E-09	5.75E-09	1.43E-08	7.73E-08	2.93E-08
Non-carcinogenic CDI-Adult		6.55E-06	1.21E-05	2.57E-07	4.02E-07	9.98E-07	5.41E-06	2.05E-06
Carcinogenic Risk	2.00E-06	NA	NA	1.87E-06	5.63E-08	NA	7.03E-08	NA
Hazard Index-Adult	5.08E-01	4.68E-02	NA	4.51E-03	7.06E-02	NA	3.86E-01	NA
Total Carcinogenic Risk	**2.00E-06**	NA	NA	1.87E-06	5.63E-08	NA	7.03E-08	NA
Total Hazard Index-Adult	**5.28E-01**	4.74E-02	1.51E-04	6.13E-03	7.09E-02	3.75E-03	3.91E-01	7.70E-03

Table 7: Risk and Hazard Index Calculations for Site Groundwater

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Residential Exposure Scenario

- Site Groundwater	COPC EPC (mg/L)	Arsenic 2.35E-02	Calcium 7.46E+01	Chromium 6.83E-02	Cr VI 2.00E-02	Nickel 2.84E-02	Vanadium 2.96E-02	Zinc 2.27E-02
Ingestion of Water								
Slope Factor-Oral		9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Oral		3.00E-04	NA	1.50E+00	3.00E-03	2.00E-02	1.00E-03	3.00E-01
Carcinogenic CDI		3.50E-04	1.11E+00	1.02E-03	2.97E-04	4.22E-04	4.40E-04	3.37E-04
Non-carcinogenic CDI-Adult		6.45E-04	2.04E+00	1.87E-03	5.48E-04	7.78E-04	8.10E-04	6.22E-04
Non-carcinogenic CDI-Child		1.50E-03	4.77E+00	4.37E-03	1.28E-03	1.81E-03	1.89E-03	1.45E-03
Carcinogenic Risk	3.33E-03	3.33E-03	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	3.19E+00	2.15E+00	NA	1.25E-03	1.83E-01	3.89E-02	8.10E-01	2.07E-03
Hazard Index-Child	7.43E+00	5.02E+00	NA	2.91E-03	4.26E-01	9.07E-02	1.89E+00	4.84E-03
Dermal Contact with Water								
Slope Factor-Oral		9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Oral		3.00E-04	NA	1.50E+00	3.00E-03	2.00E-02	1.00E-03	3.00E-01
Carcinogenic CDI		2.01E-06	6.36E-03	5.82E-06	1.70E-06	2.42E-06	2.52E-06	1.93E-06
Non-carcinogenic CDI-Adult		3.37E-06	1.07E-02	9.77E-06	2.86E-06	4.06E-06	4.23E-06	3.24E-06
Non-carcinogenic CDI-Child		9.93E-06	3.15E-02	2.88E-05	8.44E-06	1.20E-05	1.25E-05	9.57E-06
Carcinogenic Risk	1.91E-05	1.91E-05	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	1.66E-02	1.12E-02	NA	6.51E-06	9.53E-04	2.03E-04	4.23E-03	1.08E-05
Hazard Index-Child	4.90E-02	3.31E-02	NA	1.92E-05	2.81E-03	5.99E-04	1.25E-02	3.19E-05
Total Carcinogenic Risk	**3.35E-03**	3.35E-03	NA	NA	NA	NA	NA	NA
Total Hazard Index-Adult	**3.20E+00**	2.16E+00	NA	1.25E-03	1.84E-01	3.91E-02	8.15E-01	2.08E-03
Total Hazard Index-Child	**7.48E+00**	5.05E+00	NA	2.93E-03	4.29E-01	9.13E-02	1.90E+00	4.87E-03

Table 7: Risk and Hazard Index Calculations for Site Groundwater

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Construction Worker Exposure Scenario

- Site Groundwater	COPC EPC (mg/L)	Arsenic 2.35E-02	Calcium 7.46E+01	Chromium 6.83E-02	Cr VI 2.00E-02	Nickel 2.84E-02	Vanadium 2.96E-02	Zinc 2.27E-02
Ingestion of Water								
Slope Factor-Oral		9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Oral		3.00E-04	NA	1.50E+00	3.00E-03	2.00E-02	1.00E-03	3.00E-01
Carcinogenic CDI		2.63E-07	8.35E-04	7.64E-07	2.24E-07	3.17E-07	3.31E-07	2.54E-07
Non-carcinogenic CDI-Adult		1.84E-05	5.84E-02	5.35E-05	1.57E-05	2.22E-05	2.32E-05	1.78E-05
Carcinogenic Risk	2.50E-06	2.50E-06	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	9.10E-02	6.14E-02	NA	3.56E-05	5.22E-03	1.11E-03	2.32E-02	5.92E-05
Dermal Contact with Water								
Slope Factor-Oral		9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Oral		3.00E-04	NA	1.50E+00	3.00E-03	2.00E-02	1.00E-03	3.00E-01
Carcinogenic CDI		7.50E-10	2.38E-06	2.18E-09	6.37E-10	9.04E-10	9.43E-10	7.23E-10
Non-carcinogenic CDI-Adult		5.25E-08	1.66E-04	1.52E-07	4.46E-08	6.33E-08	6.60E-08	5.06E-08
Carcinogenic Risk	7.13E-09	7.13E-09	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	2.59E-04	1.75E-04	NA	1.02E-07	1.49E-05	3.17E-06	6.60E-05	1.69E-07
Total Carcinogenic Risk	**2.51E-06**	2.51E-06	NA	NA	NA	NA	NA	NA
Total Hazard Index-Adult	**9.13E-02**	6.16E-02	NA	3.57E-05	5.23E-03	1.11E-03	2.32E-02	5.94E-05

Table 8: Risk and Hazard Index Calculations for Background Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Residential Exposure Scenario

-Blue Background Soils	COPC EPC (mg/kg)	Aluminum 7.07E+03	Arsenic 6.39E+00	Barium 6.33E+01	Beryllium 4.95E-01	Cadmium 4.95E-01	Chromium 3.57E+01	Cobalt 6.45E+00	Copper 1.52E+01
Ingestion of Soil									
Slope Factor-Oral		NA	9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Oral		1.00E+00	3.00E-04	2.00E-01	2.00E-03	5.00E-04	1.50E+00	2.00E-02	4.00E-02
Carcinogenic CDI		1.11E-02	1.00E-05	9.90E-05	7.75E-07	7.75E-07	5.60E-05	1.01E-05	2.38E-05
Non-carcinogenic CDI-Adult		9.69E-03	8.75E-06	8.67E-05	6.78E-07	6.78E-07	4.90E-05	8.84E-06	2.09E-05
Non-carcinogenic CDI-Child		9.04E-02	8.17E-05	8.09E-04	6.33E-06	6.33E-06	4.57E-04	8.25E-05	1.95E-04
Carcinogenic Risk	9.50E-05	NA	9.50E-05	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	8.64E-02	9.69E-03	2.92E-02	4.33E-04	3.39E-04	1.36E-03	3.26E-05	4.42E-04	5.22E-04
Hazard Index-Child	8.06E-01	9.04E-02	2.72E-01	4.04E-03	3.16E-03	1.27E-02	3.05E-04	4.12E-03	4.87E-03
Dermal Contact with Soil									
Slope Factor-Dermal		NA	9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Dermal		1.00E+00	3.00E-04	2.00E-01	2.00E-03	2.50E-05	1.50E+00	2.00E-02	4.00E-02
Carcinogenic CDI		3.57E-04	9.68E-07	3.20E-06	2.50E-08	2.50E-09	1.81E-06	3.26E-07	7.69E-07
Non-carcinogenic CDI-Adult		3.87E-04	1.05E-06	3.46E-06	2.71E-08	2.71E-09	1.95E-06	3.53E-07	8.32E-07
Non-carcinogenic CDI-Child		2.62E-03	7.11E-06	2.35E-05	1.84E-07	1.84E-08	1.33E-05	2.39E-06	5.65E-06
Carcinogenic Risk	9.20E-06	NA	9.20E-06	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	5.83E-03	3.87E-04	3.49E-03	1.73E-05	1.35E-05	1.08E-04	1.30E-06	1.76E-05	2.08E-05
Hazard Index-Child	3.95E-02	2.62E-03	2.37E-02	1.17E-04	9.18E-05	7.34E-04	8.83E-06	1.20E-04	1.41E-04
Inhalation of Particulate Soil									
Slope Factor-Inhalation		NA	1.20E+01	NA	8.40E+00	1.50E+01	NA	9.80E+00	NA
RfD-Inhalation		1.40E-03	8.60E-06	1.40E-04	2.00E-06	5.70E-06	NA	5.70E-06	NA
Carcinogenic CDI		8.00E-07	7.22E-10	7.15E-09	5.60E-11	5.60E-11	4.04E-09	7.29E-10	1.72E-09
Non-carcinogenic CDI-Adult		1.47E-06	1.32E-09	1.31E-08	1.03E-10	1.03E-10	7.41E-09	1.34E-09	3.16E-09
Non-carcinogenic CDI-Child		3.46E-06	3.13E-09	3.10E-08	2.42E-10	2.42E-10	1.75E-08	3.16E-09	7.46E-09
Carcinogenic Risk	2.04E-08	NA	8.67E-09	NA	4.70115E-10	8.39E-10	NA	7.15E-09	NA
Hazard Index-Adult	2.65E-03	1.05E-03	1.54E-04	9.37E-05	5.13E-05	1.80E-05	NA	2.35E-04	NA
Hazard Index-Child	6.25E-03	2.47E-03	3.64E-04	2.21E-04	1.21E-04	4.25E-05	NA	5.54E-04	NA
Total Carcinogenic Risk	**1.04E-04**	NA	1.04E-04	NA	4.70E-10	8.39E-10	NA	7.15E-09	NA
Total Hazard Index-Adult	**9.48E-02**	1.11E-02	3.28E-02	5.44E-04	4.04E-04	1.48E-03	3.39E-05	6.94E-04	5.42E-04
Total Hazard Index-Child	**8.52E-01**	9.55E-02	2.96E-01	4.38E-03	3.38E-03	1.34E-02	3.13E-04	4.80E-03	5.01E-03

Table 8: Risk and Hazard Index Calculations for Background Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Residential Exposure Scenario

-Blue Background Soils	COPC EPC (mg/kg)	Lead 7.54E+00	Manganese 1.60E+02	Nickel 3.16E+01	Silver 1.88E+00	Vanadium 2.37E+01	Zinc 3.09E+01
Ingestion of Soil							
Slope Factor-Oral		NA	NA	NA	NA	NA	NA
RfD-Oral		NA	2.40E-02	2.00E-02	5.00E-03	1.00E-03	3.00E-01
Carcinogenic CDI		1.18E-05	2.50E-04	4.95E-05	2.94E-06	3.71E-05	4.84E-05
Non-carcinogenic CDI-Adult		1.03E-05	2.19E-04	4.33E-05	2.58E-06	3.24E-05	4.24E-05
Non-carcinogenic CDI-Child		9.64E-05	2.04E-03	4.05E-04	2.40E-05	3.03E-04	3.95E-04
Carcinogenic Risk	9.50E-05	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	8.64E-02		9.11E-03	2.17E-03	5.15E-04	3.24E-02	1.41E-04
Hazard Index-Child	8.06E-01		8.50E-02	2.02E-02	4.81E-03	3.03E-01	1.32E-03
Dermal Contact with Soil							
Slope Factor-Dermal		NA	NA	NA	NA	NA	NA
RfD-Dermal		NA	2.40E-02	2.00E-02	5.00E-03	1.00E-03	3.00E-01
Carcinogenic CDI		3.81E-07	8.06E-06	1.60E-06	9.50E-08	1.20E-06	1.56E-06
Non-carcinogenic CDI-Adult		4.12E-07	8.72E-06	1.73E-06	1.03E-07	1.29E-06	1.69E-06
Non-carcinogenic CDI-Child		2.80E-06	5.91E-05	1.17E-05	6.97E-07	8.78E-06	1.15E-05
Carcinogenic Risk	9.20E-06	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	5.83E-03		3.63E-04	8.65E-05	2.06E-05	1.29E-03	5.64E-06
Hazard Index-Child	3.95E-02		2.46E-03	5.87E-04	1.39E-04	8.78E-03	3.82E-05
Inhalation of Particulate Soil							
Slope Factor-Inhalation		NA	NA	9.10E-01	NA	NA	NA
RfD-Inhalation		NA	5.70E-05	1.40E-05	NA	NA	NA
Carcinogenic CDI		8.52E-10	1.80E-08	3.58E-09	2.13E-10	2.68E-09	3.50E-09
Non-carcinogenic CDI-Adult		1.56E-09	3.31E-08	6.56E-09	3.90E-10	4.91E-09	6.41E-09
Non-carcinogenic CDI-Child		3.69E-09	7.81E-08	1.55E-08	9.21E-10	1.16E-08	1.51E-08
Carcinogenic Risk	2.04E-08	NA	NA	3.26E-09	NA	NA	NA
Hazard Index-Adult	2.65E-03	NA	5.80E-04	4.69E-04	NA	NA	NA
Hazard Index-Child	6.25E-03	NA	1.37E-03	1.11E-03	NA	NA	NA
Total Carcinogenic Risk	**1.04E-04**	NA	NA	3.26E-09	NA	NA	NA
Total Hazard Index-Adult	**9.48E-02**	NA	1.00E-02	2.72E-03	5.36E-04	3.37E-02	1.47E-04
Total Hazard Index-Child	**8.52E-01**	NA	8.88E-02	2.19E-02	4.95E-03	3.12E-01	1.36E-03

Table 8: Risk and Hazard Index Calculations for Background Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Construction Worker Exposure Scenario

-Blue Background Soils	COPC EPC (mg/kg)	Aluminum 7.07E+03	Arsenic 6.39E+00	Barium 6.33E+01	Beryllium 4.95E-01	Cadmium 4.95E-01	Chromium 3.57E+01	Cobalt 6.45E+00	Copper 1.52E+01
Ingestion of Soil									
Slope Factor-Oral		NA	9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Oral		1.00E+00	3.00E-04	2.00E-01	2.00E-03	5.00E-04	1.50E+00	2.00E-02	4.00E-02
Carcinogenic CDI		3.26E-04	2.95E-07	2.92E-06	2.28E-08	2.28E-08	1.65E-06	2.98E-07	7.03E-07
Non-carcinogenic CDI-Adult		2.28E-02	2.06E-05	2.04E-04	1.60E-06	1.60E-06	1.15E-04	2.08E-05	4.92E-05
Carcinogenic Risk	2.80E-06	NA	2.80E-06	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	2.04E-01	2.28E-02	6.88E-02	1.02E-03	7.99E-04	3.20E-03	7.69E-05	1.04E-03	1.23E-03
Dermal Contact with Soil									
Slope Factor-Dermal		NA	9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Dermal		1.00E+00	3.00E-04	2.00E-01	2.00E-03	2.50E-05	1.50E+00	2.00E-02	4.00E-02
Carcinogenic CDI		4.51E-05	4.07E-08	4.03E-07	3.16E-09	3.16E-09	2.28E-07	4.11E-08	9.71E-08
Non-carcinogenic CDI-Adult		3.16E-03	2.85E-06	2.82E-05	2.21E-07	2.21E-07	1.59E-05	2.88E-06	6.80E-06
Carcinogenic Risk	3.87E-07	NA	3.87E-07	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	3.65E-02	3.16E-03	9.50E-03	1.41E-04	1.10E-04	8.83E-03	1.06E-05	1.44E-04	1.70E-04
Inhalation of Particulate Soil									
Slope Factor-Inhalation		NA	1.20E+01	NA	8.40E+00	1.50E+01	NA	9.80E+00	NA
RfD-Inhalation		1.40E-03	8.60E-06	1.40E-04	2.00E-06	5.70E-06	NA	5.70E-06	NA
Carcinogenic CDI		1.98E-05	1.79E-08	1.77E-07	1.38E-09	1.38E-09	9.99E-08	1.80E-08	4.26E-08
Non-carcinogenic CDI-Adult		1.38E-03	1.25E-06	1.24E-05	9.69E-08	9.69E-08	6.99E-06	1.26E-06	2.98E-06
Carcinogenic Risk	5.04E-07	NA	2.14E-07	NA	1.16243E-08	2.08E-08	NA	1.77E-07	NA
Hazard Index-Adult	2.50E+00	9.89E-01	1.45E-01	8.84E-02	4.84E-02	1.70E-02	NA	2.21E-01	NA
Total Carcinogenic Risk	**3.69E-06**	NA	3.40E-06	NA	1.16E-08	2.08E-08	NA	1.77E-07	NA
Total Hazard Index-Adult	**2.74E+00**	1.01E+00	2.24E-01	8.96E-02	4.93E-02	2.90E-02	8.76E-05	2.23E-01	1.40E-03

Table 8: Risk and Hazard Index Calculations for Background Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Construction Worker Exposure Scenario

-Blue Background Soils	COPC EPC (mg/kg)	Lead 7.54E+00	Manganese 1.60E+02	Nickel 3.16E+01	Silver 1.88E+00	Vanadium 2.37E+01	Zinc 3.09E+01
Ingestion of Soil							
Slope Factor-Oral		NA	NA	NA	NA	NA	NA
RfD-Oral		NA	2.40E-02	2.00E-02	5.00E-03	1.00E-03	3.00E-01
Carcinogenic CDI			7.36E-06	1.46E-06	8.67E-08	1.09E-06	1.43E-06
Non-carcinogenic CDI-Adult			5.15E-04	1.02E-04	6.07E-06	7.65E-05	9.99E-05
Carcinogenic Risk	2.80E-06	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	2.04E-01		2.15E-02	5.11E-03	1.21E-03	7.65E-02	3.33E-04
Dermal Contact with Soil							
Slope Factor-Dermal		NA	NA	NA	NA	NA	NA
RfD-Dermal		NA	2.40E-02	2.00E-02	5.00E-03	1.00E-03	3.00E-01
Carcinogenic CDI			1.02E-06	2.02E-07	1.20E-08	1.51E-07	1.97E-07
Non-carcinogenic CDI-Adult			7.12E-05	1.41E-05	8.39E-07	1.06E-05	1.38E-05
Carcinogenic Risk	3.87E-07	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	3.65E-02		2.97E-03	7.06E-04	1.68E-04	1.06E-02	4.60E-05
Inhalation of Particulate Soil							
Slope Factor-Inhalation		NA	NA	9.10E-01	NA	NA	NA
RfD-Inhalation		NA	5.70E-05	1.40E-05	NA	NA	NA
Carcinogenic CDI		2.11E-08	4.46E-07	8.85E-08	5.26E-09	6.62E-08	8.65E-08
Non-carcinogenic CDI-Adult		1.48E-06	3.12E-05	6.19E-06	3.68E-07	4.63E-06	6.05E-06
Carcinogenic Risk	5.04E-07	NA	NA	8.05E-08	NA	NA	NA
Hazard Index-Adult	2.50E+00	NA	5.48E-01	4.42E-01	NA	NA	NA
Total Carcinogenic Risk	**3.69E-06**	NA	NA	8.05E-08	NA	NA	NA
Total Hazard Index-Adult	**2.74E+00**	NA	5.72E-01	4.48E-01	1.38E-03	8.70E-02	3.79E-04

Table 8: Risk and Hazard Index Calculations for Background Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Commercial/Industrial Exposure Scenario

-Blue Background Soils	COPC EPC (mg/kg)	Aluminum 7.07E+03	Arsenic 6.39E+00	Barium 6.33E+01	Beryllium 4.95E-01	Cadmium 4.95E-01	Chromium 3.57E+01	Cobalt 6.45E+00	Copper 1.52E+01
Ingestion of Soil									
Slope Factor-Oral		NA	9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Oral		1.00E+00	3.00E-04	2.00E-01	2.00E-03	5.00E-04	1.50E+00	2.00E-02	4.00E-02
Carcinogenic CDI		2.47E-03	2.23E-06	2.21E-05	1.73E-07	1.73E-07	1.25E-05	2.25E-06	5.32E-06
Non-carcinogenic CDI-Adult		6.92E-03	6.25E-06	6.19E-05	4.84E-07	4.84E-07	3.50E-05	6.31E-06	1.49E-05
Carcinogenic Risk	2.12E-05	NA	2.12E-05	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	6.17E-02	6.92E-03	2.08E-02	3.09E-04	2.42E-04	9.69E-04	2.33E-05	3.16E-04	3.73E-04
Dermal Contact with Soil									
Slope Factor-Dermal		NA	9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Dermal		1.00E+00	3.00E-04	2.00E-01	2.00E-03	2.50E-05	1.50E+00	2.00E-02	4.00E-02
Carcinogenic CDI		2.82E-04	2.55E-07	2.52E-06	1.97E-08	1.97E-08	1.42E-06	2.57E-07	6.07E-07
Non-carcinogenic CDI-Adult		7.89E-04	7.13E-07	7.06E-06	5.52E-08	5.52E-08	3.99E-06	7.19E-07	1.70E-06
Carcinogenic Risk	2.42E-06	NA	2.42E-06	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	9.13E-03	7.89E-04	2.38E-03	3.53E-05	2.76E-05	2.21E-03	2.66E-06	3.60E-05	4.25E-05
Inhalation of Particulate Soil									
Slope Factor-Inhalation		NA	1.20E+01	NA	8.40E+00	1.50E+01	NA	9.80E+00	NA
RfD-Inhalation		1.40E-03	8.60E-06	1.40E-04	2.00E-06	5.70E-06	NA	5.70E-06	NA
Carcinogenic CDI		2.63E-07	2.38E-10	2.35E-09	1.84E-11	1.84E-11	1.33E-09	2.40E-10	5.66E-10
Non-carcinogenic CDI-Adult		7.36E-07	6.65E-10	6.58E-09	5.15E-11	5.15E-11	3.72E-09	6.71E-10	1.59E-09
Carcinogenic Risk	6.70E-09	NA	2.85E-09	NA	1.54578E-10	2.76E-10	NA	2.35E-09	NA
Hazard Index-Adult	1.33E-03	5.26E-04	7.73E-05	4.70E-05	2.58E-05	9.04E-06	NA	1.18E-04	NA
Total Carcinogenic Risk	**2.36E-05**	NA	2.36E-05	NA	1.55E-10	2.76E-10	NA	2.35E-09	NA
Total Hazard Index-Adult	**7.21E-02**	8.24E-03	2.33E-02	3.92E-04	2.96E-04	3.19E-03	2.60E-05	4.69E-04	4.15E-04

Table 8: Risk and Hazard Index Calculations for Background Soil

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Commercial/Industrial Exposure Scenario

-Blue Background Soils	COPC EPC (mg/kg)	Lead 7.54E+00	Manganese 1.60E+02	Nickel 3.16E+01	Silver 1.88E+00	Vanadium 2.37E+01	Zinc 3.09E+01
Ingestion of Soil							
Slope Factor-Oral		NA	NA	NA	NA	NA	NA
RfD-Oral		NA	2.40E-02	2.00E-02	5.00E-03	1.00E-03	3.00E-01
Carcinogenic CDI			5.57E-05	1.11E-05	6.57E-07	8.28E-06	1.08E-05
Non-carcinogenic CDI-Adult			1.56E-04	3.10E-05	1.84E-06	2.32E-05	3.03E-05
Carcinogenic Risk	2.12E-05	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	6.17E-02		6.50E-03	1.55E-03	3.68E-04	2.32E-02	1.01E-04
Dermal Contact with Soil							
Slope Factor-Dermal		NA	NA	NA	NA	NA	NA
RfD-Dermal		NA	2.40E-02	2.00E-02	5.00E-03	1.00E-03	3.00E-01
Carcinogenic CDI			6.35E-06	1.26E-06	7.49E-08	9.43E-07	1.23E-06
Non-carcinogenic CDI-Adult			1.78E-05	3.53E-06	2.10E-07	2.64E-06	3.45E-06
Carcinogenic Risk	2.42E-06	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	9.13E-03		7.41E-04	1.76E-04	4.19E-05	2.64E-03	1.15E-05
Inhalation of Particulate Soil							
Slope Factor-Inhalation		NA	NA	9.10E-01	NA	NA	NA
RfD-Inhalation		NA	5.70E-05	1.40E-05	NA	NA	NA
Carcinogenic CDI		2.80E-10	5.93E-09	1.18E-09	6.99E-11	8.80E-10	1.15E-09
Non-carcinogenic CDI-Adult		7.85E-10	1.66E-08	3.29E-09	1.96E-10	2.46E-09	3.22E-09
Carcinogenic Risk	6.70E-09	NA	NA	1.07E-09	NA	NA	NA
Hazard Index-Adult	1.33E-03	NA	2.91E-04	2.35E-04	NA	NA	NA
Total Carcinogenic Risk	**2.36E-05**	NA	NA	1.07E-09	NA	NA	NA
Total Hazard Index-Adult	**7.21E-02**	NA	7.54E-03	1.96E-03	4.10E-04	2.58E-02	1.12E-04

Table 9: Risk and Hazard Index Calculations for Background Groundwater

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Residential Exposure Scenario

- Background Groundwater	COPC EPC (mg/L)	Aluminum 4.02E-01	Arsenic 9.88E-03	Barium 1.85E-01	Cadmium 1.29E-03	Chromium 5.61E-03	Cr VI 4.00E-03	Lead 2.39E-03	Manganese 1.37E+00
Ingestion of Water									
Slope Factor-Oral		NA	9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Oral		1.00E+00	3.00E-04	2.00E-01	5.00E-04	1.50E+00	3.00E-03	NA	2.40E-02
Carcinogenic CDI		5.98E-03	1.47E-04	2.75E-03	1.92E-05	8.34E-05	5.95E-05	3.55E-05	2.04E-02
Non-carcinogenic CDI-Adult		1.10E-02	2.71E-04	5.06E-03	3.53E-05	1.54E-04	1.10E-04	6.55E-05	3.75E-02
Non-carcinogenic CDI-Child		2.57E-02	6.32E-04	1.18E-02	8.25E-05	3.59E-04	2.56E-04	1.53E-04	8.76E-02
Carcinogenic Risk	1.40E-03	NA	1.40E-03	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	2.94E+00	1.10E-02	9.02E-01	2.53E-02	7.07E-02	1.02E-04	3.65E-02	NA	1.56E+00
Hazard Index-Child	6.87E+00	2.57E-02	2.11E+00	5.90E-02	1.65E-01	2.39E-04	8.52E-02	NA	3.65E+00
Dermal Contact with Water									
Slope Factor-Oral		NA	9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Oral		1.00E+00	3.00E-04	2.00E-01	2.50E-05	1.50E+00	3.00E-03	NA	2.40E-02
Carcinogenic CDI		3.42E-05	8.42E-07	1.57E-05	1.10E-07	4.78E-07	3.41E-07	2.04E-07	1.17E-04
Non-carcinogenic CDI-Adult		5.75E-05	1.41E-06	2.64E-05	1.84E-07	8.02E-07	5.72E-07	3.42E-07	1.96E-04
Non-carcinogenic CDI-Child		1.70E-04	4.17E-06	7.79E-05	5.44E-07	2.37E-06	1.69E-06	1.01E-06	5.78E-04
Carcinogenic Risk	8.00E-06	NA	8.00E-06	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	2.24E-02	5.75E-05	4.71E-03	1.32E-04	7.38E-03	5.35E-07	1.91E-04	NA	8.16E-03
Hazard Index-Child	6.60E-02	1.70E-04	1.39E-02	3.89E-04	2.18E-02	1.58E-06	5.63E-04	NA	2.41E-02
Total Carcinogenic Risk	**1.40E-03**	NA	1.40E-03	NA	NA	NA	NA	NA	NA
Total Hazard Index-Adult	**2.97E+00**	1.11E-02	9.07E-01	2.54E-02	7.81E-02	1.03E-04	3.67E-02	NA	1.57E+00
Total Hazard Index-Child	**6.94E+00**	2.59E-02	2.12E+00	5.94E-02	1.87E-01	2.41E-04	8.58E-02	NA	3.67E+00

Table 9: Risk and Hazard Index Calculations for Background Groundwater

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Residential Exposure Scenario				
- Background Groundwater	COPC	Molybdenum	Nickel	Vanadium
	EPC (mg/L)	6.41E-03	1.27E-02	1.03E-02
Ingestion of Water				
Slope Factor-Oral		NA	NA	NA
RfD-Oral		5.00E-03	2.00E-02	1.00E-03
Carcinogenic CDI		9.53E-05	1.89E-04	1.53E-04
Non-carcinogenic CDI-Adult		1.76E-04	3.48E-04	2.82E-04
Non-carcinogenic CDI-Child		4.10E-04	8.12E-04	6.58E-04
Carcinogenic Risk	1.40E-03	NA	NA	NA
Hazard Index-Adult	2.94E+00	3.51E-02	1.74E-02	2.82E-01
Hazard Index-Child	6.87E+00	8.20E-02	4.06E-02	6.58E-01
Dermal Contact with Water				
Slope Factor-Oral		NA	NA	NA
RfD-Oral		5.00E-03	2.00E-02	1.00E-03
Carcinogenic CDI		5.46E-07	1.08E-06	8.78E-07
Non-carcinogenic CDI-Adult		9.17E-07	1.82E-06	1.47E-06
Non-carcinogenic CDI-Child		2.70E-06	5.36E-06	4.35E-06
Carcinogenic Risk	8.00E-06	NA	NA	NA
Hazard Index-Adult	2.24E-02	1.83E-04	9.08E-05	1.47E-03
Hazard Index-Child	6.60E-02	5.41E-04	2.68E-04	4.35E-03
Total Carcinogenic Risk	**1.40E-03**	NA	NA	NA
Total Hazard Index-Adult	**2.97E+00**	3.53E-02	1.75E-02	2.84E-01
Total Hazard Index-Child	**6.94E+00**	8.25E-02	4.09E-02	6.63E-01

Table 9: Risk and Hazard Index Calculations for Background Groundwater

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Construction Worker Exposure Scenario

- Background Groundwater	COPC EPC (mg/L)	Aluminum 4.02E-01	Arsenic 9.88E-03	Barium 1.85E-01	Cadmium 1.29E-03	Chromium 5.61E-03	Cr VI 4.00E-03	Lead 2.39E-03	Manganese 1.37E+00
Ingestion of Water									
Slope Factor-Oral		NA	9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Oral		1.00E+00	3.00E-04	2.00E-01	5.00E-04	1.50E+00	3.00E-03	NA	2.40E-02
Carcinogenic CDI		4.50E-06	1.10E-07	2.06E-06	1.44E-08	6.27E-08	4.47E-08	2.67E-08	1.53E-05
Non-carcinogenic CDI-Adult		3.15E-04	7.73E-06	1.45E-04	1.01E-06	4.39E-06	3.13E-06	1.87E-06	1.07E-03
Carcinogenic Risk	1.05E-06	NA	1.05E-06	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	8.41E-02	3.15E-04	2.58E-02	7.23E-04	2.02E-03	2.93E-06	1.04E-03	NA	4.47E-02
Dermal Contact with Water									
Slope Factor-Oral		NA	9.50E+00	NA	NA	NA	NA	NA	NA
RfD-Oral		1.00E+00	3.00E-04	2.00E-01	2.50E-05	1.50E+00	3.00E-03	NA	2.40E-02
Carcinogenic CDI		1.28E-08	3.15E-10	5.88E-09	4.11E-11	1.79E-10	1.27E-10	7.62E-11	4.37E-08
Non-carcinogenic CDI-Adult		8.97E-07	2.20E-08	4.12E-07	2.88E-09	1.25E-08	8.92E-09	5.33E-09	3.06E-06
Carcinogenic Risk	2.99E-09	NA	2.99E-09	NA	NA	NA	NA	NA	NA
Hazard Index-Adult	3.49E-04	8.97E-07	7.35E-05	2.06E-06	1.15E-04	8.34E-09	2.97E-06	NA	1.27E-04
Total Carcinogenic Risk	**1.05E-06**	NA	1.05E-06	NA	NA	NA	NA	NA	NA
Total Hazard Index-Adult	**8.45E-02**	3.16E-04	2.59E-02	7.25E-04	2.13E-03	2.94E-06	1.05E-03	NA	4.48E-02

Table 9: Risk and Hazard Index Calculations for Background Groundwater

Updated HHRA for IWTP 360, Alameda Point, Alameda, California

Construction Worker Exposure Scenario

- Background Groundwater	COPC	Molybdenum	Nickel	Vanadium
	EPC (mg/L)	6.41E-03	1.27E-02	1.03E-02
Ingestion of Water				
Slope Factor-Oral		NA	NA	NA
RfD-Oral		5.00E-03	2.00E-02	1.00E-03
Carcinogenic CDI		7.17E-08	1.42E-07	1.15E-07
Non-carcinogenic CDI-Adult		5.02E-06	9.94E-06	8.06E-06
Carcinogenic Risk	1.05E-06	NA	NA	NA
Hazard Index-Adult	8.41E-02	1.00E-03	4.97E-04	8.06E-03
Dermal Contact with Water				
Slope Factor-Oral		NA	NA	NA
RfD-Oral		5.00E-03	2.00E-02	1.00E-03
Carcinogenic CDI		2.04E-10	4.05E-10	3.28E-10
Non-carcinogenic CDI-Adult		1.43E-08	2.83E-08	2.30E-08
Carcinogenic Risk	2.99E-09	NA	NA	NA
Hazard Index-Adult	3.49E-04	2.86E-06	1.42E-06	2.30E-05
Total Carcinogenic Risk	**1.05E-06**	NA	NA	NA
Total Hazard Index-Adult	**8.45E-02**	1.01E-03	4.98E-04	8.09E-03

Attachment 1. DTSC LeadSpread Calculations for Site Surface Soil and Background Groundwater, and Site Subsurface Soil and Background Groundwater

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

USER'S GUIDE to version 7

INPUT

MEDIUM	LEVEL
Lead in Air (ug/m^3)	0.028
Lead in Soil/Dust (ug/g)	5.0
Lead in Water (ug/l)	2.4
% Home-grown Produce	7%
(ug/m^3)	1.5

OUTPUT

	Percentile Estimate of Blood Pb (ug/dl) 50th	90th	95th	98th	99th	PRG-99 (ug/g)	PRG-95 (ug/g)
BLOOD Pb, ADULT	0.4	0.8	0.9	1.1	1.2	889	1276
BLOOD Pb, CHILD	0.8	1.4	1.6	2.0	2.3	210	311
BLOOD Pb, PICA CHILD	0.8	1.4	1.7	2.1	2.4	135	200
BLOOD Pb, OCCUPATION	0.4	0.7	0.9	1.1	1.2	4570	6559

EXPOSURE PARAMETERS

	units	adults	children
Days per week	days/wk	7	
Days per week, occupational		5	
Geometric Standard Deviation		1.6	
Blood lead level of concern (ug/dl)		10	
Skin area, residential	cm^2	5700	2900
Skin area occupational	cm^2	2900	
Soil adherence	ug/cm^2	70	200
Dermal uptake constant	(ug/dl)/(ug/d	0.0001	
Soil ingestion	mg/day	50	100
Soil ingestion, pica	mg/day		200
Ingestion constant	(ug/dl)/(ug/d	0.04	0.2
Bioavailability	unitless	0.44	
Breathing rate	m^3/day	20	6.8
Inhalation constant	(ug/dl)/(ug/d	0.08	0.2
Water ingestion	l/day	1.4	0.4
Food ingestion	kg/day	1.9	1.1
Lead in market basket	ug/kg	3.1	
Lead in home-grown produce	ug/kg	2.3	

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PATHWAYS

ADULTS	Residential			Occupational		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	3.8E-5	0.00	0%	1.4E-5	0.00	0%
Soil Ingestion	8.8E-4	0.00	1%	6.3E-4	0.00	1%
Inhalation, bkgrnd		0.05	11%		0.03	8%
Inhalation	2.5E-6	0.00	0%	1.8E-6	0.00	0%
Water Ingestion		0.13	32%		0.13	33%
Food Ingestion, bkgrnd		0.22	52%		0.23	58%
Food Ingestion	2.4E-3	0.01	3%			0%

CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.6E-5	0.00	0%		0.00	0%
Soil Ingestion	7.0E-3	0.04	5%	1.4E-2	0.07	9%
Inhalation	2.0E-6	0.00	0%		0.00	0%
Inhalation, bkgrnd		0.04	5%		0.04	5%
Water Ingestion		0.15	20%		0.15	19%
Food Ingestion, bkgrnd		0.50	66%		0.50	64%
Food Ingestion	5.5E-3	0.03	4%		0.03	4%

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

USER'S GUIDE to version 7

INPUT	
MEDIUM	LEVEL
Lead in Air (ug/m^3)	0.028
Lead in Soil/Dust (ug/g)	23.4
Lead in Water (ug/l)	2.4
% Home-grown Produce	7%
(ug/m^3)	1.5

OUTPUT	Percentile Estimate of Blood Pb (ug/dl)					PRG-99	PRG-95
	50th	90th	95th	98th	99th	(ug/g)	(ug/g)
BLOOD Pb, ADULT	0.5	0.9	1.0	1.2	1.4	889	1276
BLOOD Pb, CHILD	1.0	1.8	2.1	2.6	3.0	210	311
BLOOD Pb, PICA CHILD	1.2	2.1	2.5	3.0	3.4	135	200
BLOOD Pb, OCCUPATION	0.4	0.8	0.9	1.1	1.2	4570	6559

EXPOSURE PARAMETERS	units	adults	children
Days per week	days/wk	7	
Days per week, occupational		5	
Geometric Standard Deviation		1.6	
Blood lead level of concern (ug/dl)		10	
Skin area, residential	cm^2	5700	2900
Skin area occupational	cm^2	2900	
Soil adherence	ug/cm^2	70	200
Dermal uptake constant	(ug/dl)/(ug/d	0.0001	
Soil ingestion	mg/day	50	100
Soil ingestion, pica	mg/day		200
Ingestion constant	(ug/dl)/(ug/d	0.04	0.2
Bioavailability	unitless	0.44	
Breathing rate	m^3/day	20	6.8
Inhalation constant	(ug/dl)/(ug/d	0.08	0.2
Water ingestion	l/day	1.4	0.4
Food ingestion	kg/day	1.9	1.1
Lead in market basket	ug/kg	3.1	
Lead in home-grown produce	ug/kg	10.5	

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PATHWAYS						
ADULTS	Residential			Occupational		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	3.8E-5	0.00	0%	1.4E-5	0.00	0%
Soil Ingestion	8.8E-4	0.02	4%	6.3E-4	0.01	4%
Inhalation, bkgrnd		0.05	10%		0.03	8%
Inhalation	2.5E-6	0.00	0%	1.8E-6	0.00	0%
Water Ingestion		0.13	28%		0.13	32%
Food Ingestion, bkgrnd		0.22	46%		0.23	56%
Food Ingestion	2.4E-3	0.06	12%			0%

CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.6E-5	0.00	0%		0.00	0%
Soil Ingestion	7.0E-3	0.16	17%	1.4E-2	0.33	29%
Inhalation	2.0E-6	0.00	0%		0.00	0%
Inhalation, bkgrnd		0.04	4%		0.04	3%
Water Ingestion		0.15	16%		0.15	13%
Food Ingestion, bkgrnd		0.50	51%		0.50	44%
Food Ingestion	5.5E-3	0.13	13%		0.13	11%

APPENDIX D

ECOLOGICAL RISK ASSESSMENT FOR SITES 3, 4, 11, AND 21, ALAMEDA POINT, ALAMEDA CALIFORNIA

- This appendix has been extracted from the Remedial Investigation Report for OU-2B sites (Tetra Tech EM Inc. 1999); it is known therein as Appendix G and has not been re-named. It is reproduced here in its entirety.

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Delivery Order 030

APPENDIX G
DRAFT ECOLOGICAL RISK ASSESSMENT
SITES 3, 4, 11, and 21
ALAMEDA POINT

February 13, 2004

Prepared for

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ACRONYMS AND ABBREVIATIONS

amu	Atomic mass units
AST	Above ground storage tank
ATSDR	Agency for Toxic Substances and Disease Registry
AVGAS	Aviation gasoline
AWQC	Ambient Water Quality Criteria
BA_{mammal}	Biotransfer factor for mammals
BCF	Bioconcentration factor
$BCF_{food\ item\text{-}to\text{-}mammal}$	Bioconcentration factor for uptake of constituent from food item tissues to mammal tissues
$BCF_{plant\text{-}to\text{-}mammal}$	Bioconcentration factor for uptake of constituent from plant tissues to mammal tissues
$BCF_{soil\text{-}to\text{-}invert}$	Bioconcentration factor for uptake of constituent from soil to invertebrate tissue
$BCF_{soil\text{-}to\text{-}mammal}$	Bioconcentration factor for uptake of constituent from soil to mammal tissue
$BCF_{soil\text{-}to\text{-}plant}$	Bioconcentration factor for uptake of constituent from soil to plant tissue
BTAG	Biological Technical Advisory Group
BW	Body weight
$C_{groundsquirrel}$	Concentration of chemical in ground squirrel tissue
C_{invert}	Concentration of chemical in invertebrate tissue
C_{plant}	Concentration of chemical in plant tissue
C_{soil}	Concentration of chemical in soil
CAA	Corrective Action Areas
Cal/EPA	California Environmental Protection Agency
CCC	Criteria Continuous Concentration
CDFG	California Department of Fish and Game
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMC	Criteria Maximum Concentration
COPC	Chemical of potential concern
CSM	Conceptual site model
CWA	Clean Water Act
DDD	4,4'-Dichlorodiphenyldichloroethane
DDE	4,4'-Dichlorodiphenyldichloroethene
DDT	4,4'-Dichlorodiphenyltrichloroethane
DDTt	Total DDT

DTSC	California Environmental Protection Agency Department of Toxic Substances Control
EFA WEST	Naval Facilities Engineering Command, Engineering Field Activity West
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
ERA	Ecological risk assessment
ERM-West	Environmental Resources Management-West, Inc.
ERV	Ecological reference value
Fi	The fraction of the ground squirrel diet that consists of invertebrates
F_p	The fraction of the ground squirrel diet that consists of plants
FCM	Food-chain multiplier
FWS	U.S. Fish and Wildlife Service
GI	Gastrointestinal
HERD	Human and Ecological Risk Division
HMW	High-molecular weight
HQ	Hazard quotient
HSDB	Hazardous Substances Database
$IR_{food\ item}$	Ingestion rate of food item
$IR_{groundsquirrel}$	Ground squirrel tissue ingestion rate
IR_{invert}	Invertebrate tissue ingestion rate
IR_{plant}	Plant tissue ingestion rate
IR_{soil}	Incidental soil ingestion rate
IT	International Technology Corporation
K_{ow}	Octanol-water partition coefficient
LMW	Low-molecular weight
Log	Logarithm
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
mg/kg-DW	Milligram per kilogram Dry Weight
mg/kg-FW	Milligram per kilogram Fresh Weight
mg/L	Milligram per liter
MOGAS	Motor gasoline
Navy	U.S. Department of the Navy
NLM	National Library of Medicine

ACRONYMS AND ABBREVIATIONS (Continued)

NOAA	National Oceanic and Atmospheric Administration
ORNL	Oak Ridge National Laboratory
OU	Light Industrial Operable Unit
OWS	Oil-water separator
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
QE	Qualitative evaluation
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
SUF	Site use factor
SVOC	Semivolatile organic compound
TCA	Trichloroethane
TRV	Toxicity reference value
Tetra Tech	Tetra Tech EM Inc.
UCL95	95th percentile upper confidence limit on the arithmetic mean
UST	Underground storage tank
VOC	Volatile organic compound

G.1 INTRODUCTION

This ecological risk assessment (ERA) is part of a remedial investigation (RI) being conducted by the U.S. Department of the Navy (Navy) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at CERCLA Sites 3, 4, 11, and 21 at Alameda Point (formerly Naval Air Station Alameda) in Alameda County, California. These sites are located within the Light Industrial Operable Unit (OU), referred to as "OU-2B." All of the sites are industrial areas with limited habitat for ecological receptors, and the reuses planned for the sites involve industrial, commercial, and residential settings. The purpose of this ERA was to evaluate residual chemicals at the OU-2B sites to determine their potential risks to ecological receptors.

A screening-level ERA was prepared for the OU-2B sites in 1999 (Tetra Tech EM Inc. [Tetra Tech) 1999]. The screening-level ERA for the OU-2B sites indicated that risk to ecological receptors was possible at the sites based on the conservative assumptions used and that additional investigations were needed to address significant data gaps. These additional data gap investigations resulted in the collection of additional soil and groundwater samples for analysis from the sites.

To reduce the level of uncertainty in the screening-level ERA, a baseline ERA, including the new data from the data gap sampling, was deemed to be necessary. The urban nature of the sites, however, precluded the collection of site-specific tissue samples that could be used to reduce the uncertainty in the screening-level ERA. Because limited habitat at the sites does not support site-specific ecological sampling needed for baseline ERAs, a typical baseline ERA is not feasible. A modified ERA was conducted for OU-2B. This modified ERA is intended to be a conservative estimate that uses more realistic exposure parameters for the ecological endpoints defined than would typically be used for a screening-level ERA. In addition, because habitat is limited at the sites and future land use would not result in additional habitat, it is unlikely that ecological receptors would use the sites in any significant manner. The methodology used to conduct the assessments and the results of the ERA are presented in this appendix. This ERA methodology follows U.S. Environmental Protection Agency (EPA) guidance for screening-level and baseline ERAs as well as Navy ERA guidance (EPA 1997a; Navy 1999).

This ERA is organized into the following sections:

- Section G.1 presents the scope and process used to conduct the modified screeninglevel ERA at Sites 3, 4, 11, and 21.
- Section G.2 presents the site-specific modified ERA results and conclusions for Sites 3, 4, 11, and 21.
- Attachment A presents the ecotoxicological profiles for ecological chemicals of potential concern (COPC) at Alameda Point.

References are provided after Section G.2 of this appendix.

G.1.1 SCOPE

A modified ERA was conducted for OU-2B Sites 3, 4, 11, and 21. Figure G-1 identifies the locations of these sites relative to other features at Alameda Point.

The following presents the ERA process used to evaluate potential risks to ecological receptors associated with ecological COPCs at OU-2B. This ERA is composed of two major steps: (1) problem formulation and (2) exposure estimates and risk calculations. The problem formulation step results in development of an ecological conceptual site model (CSM) for exposure at each site and selection of assessment and measurement endpoints. The exposure estimate and risk calculation parameters used in the assessment were generally based on average values instead of the most conservative values. These modifications resulted in a more realistic estimate of potential risk to selected assessment endpoints; however, these estimates are still relatively conservative.

This ERA incorporates conservative assumptions to represent site-specific information in a manner that minimizes the probability of underestimating ecological risks. Because of the conservative nature of the assessment, potential risks identified in the ERA should not be interpreted to imply that a risk actually exists.

G.1.2 DESCRIPTION OF THE ECOLOGICAL RISK ASSESSMENT PROCESS

The following sections present a description of the process used in conducting the modified screening-level ERA for Sites 3, 4, 11, and 21.

G.1.2.1 Screening for Ecological Chemicals of Potential Concern

Soil and groundwater sampling data were collected within and near Sites 3, 4, 11, and 21 through several sampling efforts, and these data were used to characterize the sites. Only data collected under the Installation Restoration Program with the objective of characterizing CERCLA activities and that reflect the current conditions at the sites were used in the ERA. Groundwater data collected from 1998 through 2002 were used. Data from soils that are no longer present at the sites because of removal actions were not included because they do not reflect the current conditions at the sites. Only the polynuclear aromatic hydrocarbon (PAH) data from the 2003 sampling event, rather than historic data, were included in the ERA. See Section 3.4.3 of the main RI report for more information regarding quality of the data used in the final data set for the ERA evaluations.

The data described above were used to develop ecological COPCs for the OU-2B sites. Ecological COPCs are site-related chemicals that have the potential for causing adverse effects to ecological receptors. The 95th percentile upper confidence limit on the arithmetic mean (UCL95) and standard deviation values were calculated for each detected constituent. For chemicals detected in less than 15 percent of the samples collected, one-half the reporting limit was substituted for each nondetect measurement in all calculations. The exposure point concentration (EPC) for each site was the lower of the UCL95 or maximum detected value and was used to identify ecological COPCs. The distribution of each chemical (that is, normal, lognormal, or unknown) was taken into consideration when calculating the UCL95. When a constituent was detected in less than three of the total samples collected, a UCL95 was not calculated, and the maximum detected value was used as the EPC.

The following sections discuss the identification of ecological COPCs in soil.

G.1.2.1.1 Identification of Ecological Chemicals of Potential Concern in Soil

EPCs were calculated as discussed in Section G.1.2.1. Constituents detected in the soils were subjected to a screening process to focus the ERA on chemicals that are site-specific and that pose the greatest potential risk to ecological receptors. The screening was a sequential process that considered factors such as frequency of detection, spatial distribution of detected chemicals, statistical comparison to background concentrations for inorganic chemicals, and chemical properties such as bioaccumulation and toxicity. The following are the steps involved in the chemical screening process; a detailed flow chart is presented in Figure G-2.

Step 1: Certain inorganic chemicals are essential nutrients that may be eliminated as ecological COPCs, according to guidance documents issued by EPA and the California Environmental Protection Agency Department of Toxic Substances Control (DTSC). These chemicals are calcium, iron, magnesium, potassium, and sodium. The first step in the ecological COPC screening process was to exclude these essential nutrients as ecological COPCs. Chemicals not identified as essential nutrients were screened further by the criteria in Step 2.

Step 2: The second step in the ecological COPC screening process was to calculate the frequency of detection for all detected chemicals. All chemicals with a frequency of detection of 5 percent or less were further screened in Step 3. Inorganic chemicals with a frequency of detection of greater than 5 percent were screened further in Step 4. Organic chemicals with a frequency of detection greater than 5 percent were selected as ecological COPCs.

Step 3: Chemicals with a frequency of detection of 5 percent or less were screened based on their bioaccumulation potential and toxicity. Octanol-water partition coefficient $_{(K_{Ow})}$ values for a chemical are correlated with their bioaccumulation potential because $_{K_{Ow}}$ values provide a measure of the tendency of a chemical to partition into lipids (fat tissues). Constituents detected in the soils, with $_{K_{Ow}}$ values greater than 3.0, were considered to have significant bioaccumulation potential. Chemical toxicity was evaluated by literature review. If the chemical was associated with significant bioaccumulation or high toxicity (to a specific receptor), it was retained as an ecological COPC.

Step 4: The concentrations of inorganic chemicals with a frequency of detection greater than 5 percent were compared statistically to background levels established for Alameda Point in a manner that was consistent with the methodology identified in the document "Procedural Guidance for Statistically Analyzing Environmental Background Data (Navy 1998a)." Any inorganic chemical detected at levels determined to be statistically similar to or less than background was removed from consideration as an ecological COPC. This comparison was not conducted for organic chemicals because organic chemicals are not naturally occurring and do not have a natural background level with which to compare.

G.1.2.1.2 Identification of Chemicals of Potential Ecological Concern in Groundwater

UCL95s were calculated as discussed previously in Section G.1.2.1. Like the soil ecological COPC screening process, described in Section G.1.2.1.1, the screening of groundwater was a sequential process. All groundwater at Sites 3, 4, 11, and 21 was considered as a single unit for evaluating groundwater exposure to ecological receptors. The following are the steps involved in the constituent screening process for groundwater; a detailed flow chart is presented in Figure G-3.

Steps 1 through 4: Ecological COPC screening for groundwater was conducted as described in Section G.1.2.1.1 of this appendix. Chemicals retained from these steps were further evaluated in Step 5.

Step 5: Water quality criteria issued pursuant to the Clean Water Act (CWA), Section 304(a), were used to identify groundwater ecological COPCs based on the groundwater to surface water exposure pathway. According to the CWA, water quality criteria are intended to accurately reflect the latest scientific knowledge of the effects of many chemicals on aquatic and marine life. EPA, state agencies, and other organizations use water quality criteria to evaluate the potential impacts of concentrations of chemicals in freshwater and marine ecosystems. The concentrations of chemicals detected in the groundwater at OU-2B were compared to the California Toxic Rule Criteria (EPA) for Enclosed Bays and Estuaries, Saltwater Aquatic Life Protection, or if these values were not available, to the EPA National Ambient Water Quality Criteria (AWQC) for Saltwater Aquatic Life Protection (California Environmental Protection Agency [Cal/EPA] 2000; EPA 1999a). Chemicals exceeding the criteria continuous concentration (CCC) or one-tenth the criteria maximum concentration (CMC) for salt water (when no CCC was available) were retained as ecological COPCs and screened further in Step 6. The CCC is an estimate of the highest concentration of a chemical in surface water to which an aquatic community can be exposed indefinitely without resulting in unacceptable effects, which is synonymous with a chronic effect. The CMC is a single maximum dose that produces adverse effects, which is synonymous with an acute effect. Precedence was given to the CCC when available because chronic effects are more applicable at Alameda Point. When a CCC was not available, one-tenth of the CMC was used as a default value to estimate chronic effects. Those chemicals for which the maximum concentration detected was less than the CCC or one-tenth of the CMC, whichever was applicable, were not retained as ecological COPCs. Those above the CCC or one-tenth of the CMC were screened further in Step 6.

Step 6: The National Oceanographic and Atmospheric Administration (NOAA) applies a dilution factor of 10 to compare chemical concentrations in groundwater to surface water quality criteria to account for dilution and attenuation as groundwater mixes with surface water at a discharge point (NOAA 1999). Based on NOAA's practice, chemicals with maximum groundwater concentrations exceeding water quality criteria were divided by a factor of 10 to account for the dilution that occurs as groundwater mixes with surface water in the Seaplane Lagoon. This diluted value was compared to the CCC or one-tenth of the CMC. Chemicals for which the diluted maximum concentration was less than the CCC or one-tenth of the CMC for salt water were not retained as ecological COPCs. Those chemicals for which the diluted maximum concentration exceeded the CCC or one-tenth of the CMC were selected as ecological COPCs.

G.1.2.2 Problem Formulation

Problem formulation represents the stage of the ERA process where the goals, breadth, and focus of the assessment are determined. The major goal of the problem formulation step was to develop an ecological CSM that addressed the following five issues:

1. Environmental setting and chemicals known or suspected to exist at the site 2.

Chemical fate and transport mechanisms that might exist at the site

3. Mechanisms of ecotoxicity associated with chemicals and likely categories of receptors that could be affected

4. Complete exposure pathways that might exist at the site (a complete exposure pathway is one in which the chemical has traveled, or could travel, from the source to a receptor)

5. Selection of assessment and measurement endpoints to screen for ecological risk

The following sections summarize specific issues associated with problem formulation for OU-2B sites.

G.1.2.2.1 Evaluation of Environmental Setting and Chemicals

The screening-level problem formulation began with the collection of information on the environmental setting and a listing of the physical and chemical characteristics of chemicals known to exist at each site. The environmental setting information included site (1) history, (2) habitats, and (3) animal and plant species, including special status species. In addition, a literature search of site reports, review of maps and aerial photographs, communications with regulatory agencies, and site visits were used to gather information on valuable ecological resources at the facility. Valuable ecological resources include those that are critical to ecosystem function, provide critical resources, or are perceived by humans as being valuable.

Habitat and animal and plant species were identified by (1) reviewing site-specific literature and data, (2) conducting site reconnaissance in June 1995 and June 1997, and (3) conducting a site visit in October 1998. The U.S. Fish and Wildlife Service (FWS) identified special status species that occur or are expected to occur at Alameda Point (1993). Special status species are defined as (1) plants and animals officially listed or proposed for listing under state or federal Endangered Species Acts, (2) state or federal candidate species for possible listing, (3) California Department of Fish and Game (CDFG) "Species of Special Concern," and (4) species designated as "sensitive" by federal land managers. In addition, "special species" that are not state or federally designated as threatened or endangered were identified by CDFG. These "special species" fall into one or more of the following categories (1) species that are biologically rare, very restricted in distribution, declining throughout their range, or reside in California during a critical stage in their life cycle; (2) populations in California that may be peripheral to the major population of a species range, but are threatened with extermination in California; and (3) species closely associated with habitats that are declining in California such as wetland, riparian, and primary forest habitats. Based on literature reviews, four rare plants, four rare fishes, one special status species reptile, 29 special status species birds and associated sensitive habitat, and seven special status species mammals could potentially occur at Alameda Point (see Tables G-1 and G-2).

Site reconnaissance of Alameda Point was conducted in 1995 and 1997 to assess habitats and species at Alameda Point and to augment literature sources. These reconnaissance efforts were conducted following the protocols presented in the EPA Region 9 Reconnaissance Work Plan (PRC Environmental Management, Inc. 1995). Terrestrial habitats were delineated, and the dominant vegetation was identified. Additionally, these reconnaissance efforts provided information on the physical layout of each site; existing habitat types and distributions, potential migration pathways, and exposure pathways; and the potential for nonchemical stressors at each site. Table G-3 identifies the dominant vegetation and fauna present at OU-2B sites, and Figure G-4 depicts the habitat at Sites 3, 4, 11, and 21.

G.1.2.2.2 Evaluation of Chemical Fate and Transport

The physical and chemical properties of ecological COPCs at each site were evaluated because these properties govern chemical and biological transformation processes, bioaccumulation potential, and transport properties. Based on this evaluation, the fate and transport potential of each ecological COPC was assessed. The fate and transport assessment was used to evaluate potential exposure pathways.

The movement of chemicals in the environment depends on several factors such as vapor pressure, solubility, and adsorption. These factors govern the distribution of chemicals among various phases (gas, liquid, or solid) and a chemical's mobility and persistence in the environment. Chemical and structural properties of organic chemicals determine resistance to biological and chemical degradation and, therefore, govern persistence of the chemical in the environment. Physical properties are more important when developing the ecological CSM because current chemical concentrations and their potential transport mechanisms are being assumed. Literature data on the following physical properties were evaluated to assist in development of the ecological CSM.

Water Solubility

Water solubility is a critical property affecting the fate of chemicals in the environment. Highly soluble chemicals can be leached rapidly from wastes and soils into groundwater, where they are transported by groundwater. The mobility of chemicals in soil is proportional to their water solubility. Solubilities can range from less than 1 milligram per liter (mg/L) to totally miscible, with most common organic chemicals exhibiting solubilities greater than 1 mg/L (Lyman and others 1982). Water solubility is influenced by several factors such as pH, temperature, salinity, dissolved organic carbon, and the presence of cosolvents. Chemicals with solubilities greater than 1,000 mg/L are expected to be mobile in soil. The pesticides and polychlorinated biphenyls (PCB) detected in the soils at OU-2B sites have a water solubility of less than 1 mg/L, and most of the semivolatile organic chemicals (SVOC) and volatile organic chemicals (VOC) have water solubilities of greater than 1000 mg/L.

Vapor Pressure

Volatilization is the transformation of a compound from a liquid or solid to a gas. As a gas, a compound's mobility is generally higher because of advection (flow) of air and diffusion. Volatilization of a compound depends on its vapor pressure, water solubility, and air diffusion coefficient. Highly water-soluble chemicals generally have lower volatilization rates from water, unless they also have high vapor pressures. Vapor pressure (a relative measure of the volatility of a chemical in its pure state) ranges from roughly 0.001 to 760 millimeters of mercury for liquids. Henry's Law constant, which is a function of vapor pressure and solubility, is more appropriate than vapor pressure alone for estimating releases from water to air. Chemicals with Henry's Law constants greater than 0.001 atmosphere per cubic meters per mole can be expected to volatilize readily from water; those with values ranging from 0.001 to 0.00001 are associated with moderate volatilization; chemicals with values less than 1.0E-05 will volatilize from water only to a limited extent (Lyman and others 1982). Chemicals with high vapor pressure will preferentially partition from soils and surface water to the air.

Octanol-water Partition Coefficient

The K_{OW} indicates the tendency of dissolved organic chemicals to partition from water into the lipids of an organism or into organic matter found in soil or sediment. High K_{OW} values are strongly correlated with a chemical's propensity to bioaccumulate. K_{OW} is the ratio of the solute concentration in octanol to the solute concentration in water at equilibrium and is calculated by dissolving a given mass of the chemical of interest in a container holding octanol and water. K_{ow} can be measured accurately up to values in the range of 106 (Mackay and others 1992). In the event that measured K_{OW} values are not available, Lyman and others (1982) have summarized estimation methods for predicting K_{OW} values for a chemical based on substituent groups or fragment constants.

Bioconcentration, Bioaccumulation, and Biomagnification

Bioconcentration is the process resulting in a net accumulation of a chemical in an organism (such as fish) from direct exposure to a medium such as water (EPA 1997b).

Bioaccumulation is the process by which chemicals are taken up by an organism, either directly from a contaminated medium or by consumption of contaminated foods (EPA 1997b). In the dose assessment of an ERA, it is sometimes necessary to assess chemical exposure from multiple routes if each route contributes significantly to the total dose. It is often possible in most ERAs to assume that one route of exposure is dominant and others are negligible (Suter 1993).

Biomagnification results from the processes of bioaccumulation and biotransfer, through which tissue concentrations of chemicals in organisms at one trophic level exceed tissue concentrations in organisms at the next lower trophic level in a food chain (EPA 1997b). The term implies an efficient transfer of chemical from food to consumer so that residue concentrations increase systematically from one trophic level to the next.

Fate and Transport Assumptions

To develop the ecological CSM, site conditions and the physical and chemical properties of the ecological COPCs were evaluated. Physical fate processes of concern include transport to groundwater, volatilization to air, transfer to surface water, and movement of contaminated soil particles through windblown dust or as suspended soil particles in surface water. The following assumptions were used to evaluate various transport mechanisms.

All ecological COPCs in soils were assumed to be leaching to groundwater. Groundwater was assumed to be inaccessible to terrestrial ecological receptors unless evidence of groundwater discharge was present in the immediate area of the site. If evidence of groundwater discharge occurred in the immediate area of the site, groundwater was assumed to be surface water that could be consumed by ecological receptors. It was assumed that impacted groundwater was discharging into Seaplane Lagoon from OU-2B sites; therefore, groundwater expression was a complete exposure pathway at OU-2B for aquatic receptors.

The air exposure pathway was considered to be complete for inhalation of contaminated dust or vapors if the site had significant areas of exposed soils or volatile ecological COPCs. Limited areas of exposed soils exist at the OU-2B sites. VOCs only occur in relatively low concentrations; therefore, exposure to airborne vapors and dust was not considered a significant exposure pathway for evaluation purposes

Each site was evaluated to determine whether rainfall runoff went into the storm sewer system or collected in low spots on the site. Exposure to surface water did not occur in association with the OU-2B sites.

Direct contact and ingestion pathways for contaminated soils were assumed to be complete at OU-2B sites.

Food chain exposure to chemicals was assumed to occur at the sites with complete exposure pathways. The food chain exposure evaluation was based on the food web presented in Figure G-5.

G.1.2.2.3 Ecotoxicity Evaluation

Ecological COPCs associated with OU-2B sites of Alameda Point include metals, pesticides, PCBs, SVOCs, and VOCs. A literature review was conducted to identify potential toxic effects posed by the ecological COPCs on ecological receptors. These ecological COPCs induce a variety of effects that depend on species and trophic level. Literature information collected on potential ecotoxicological effects is summarized in Attachment A of this appendix. This information was used in the selection of assessment and measurement endpoints.

G.1.2.2.4 Development of Toxicity Reference Values for Soil

Toxicity reference values (TRV) or ecological reference values (ERV) were used to assess the toxicity of ecological COPCs in the soil. A TRV or ERV is a concentration or daily dose at which a particular biological effect may occur in an organism, based on laboratory toxicological investigations. The Navy, the EPA Region 9 Biological Technical Advisory Group (BTAG), and Tetra Tech (Navy 1998b) developed TRVs as a result of an ecological effect evaluation for mammalian and avian receptors. This evaluation resulted in development of high and low TRVs for a number of ecological COPCs commonly detected at Navy facilities in California (Navy 1998b). The low TRV is a conservative screening value consistent with a chronic no effects level; the high TRV is a less conservative value consistent with an effect level, at which a specific biological effect was observed in a laboratory test organism. The high TRV, therefore, is a value at which the potential for adverse effects exists. If a Navy TRV was not available for an ecological COPC or endpoint, ERVs previously developed for other Navy facilities in California were used, if available. If no ERVs for Navy facilities were available, other sources of conservative ERVs, such as Toxicological Benchmarks for Wildlife (Sample and others 1996), were used.

The Navy established a low, mammalian TRV for lead of 0.0015 milligram per kilogram per day (mg/kg-day) in 1997, which was based on a study by Krasovskii and others (1979). This study evaluated reproductive, hematological, and neurological effects of lead in rats; however, this TRV was revised by BTAG in November 2002 based on a request by the U.S. Department of the Army (2001), which stated that the Krasovskii and others (1979) study was inadequate for the purpose of TRV development. The new low mammalian TRV of 1 mg/kg-day was developed based primarily on a study by Fowler and others (1980). This study evaluated renal effects in rats. The justification and rationale for the establishment of the new low mammalian TRV is presented in the DTSC Human and Ecological Risk Division (HERD), HERD Ecological Risk Assessment Note, No. 5 (2002).

If the species representing the measurement endpoint was different from the species used to develop the ERV, dietary concentrations were converted to dose (that is, milligram of ecological COPC per kilogram of body weight per day) for comparison with estimated ecological COPC ingestion rates in receptor species. All TRVs and ERVs were adjusted to account for the difference in body weights between the study organism and the measurement endpoint receptor, based on the allometric equations recommended by Sample and Arenal (1998). The mean, chemical-specific, scaling factors determined were 1.2 and 0.94 for birds and mammals, respectively (Sample and Arenal 1998). The resulting ERVs were used in risk calculations.

Toxicity was evaluated by one of the following methods for ecological COPCs and endpoints not covered by the Navy TRV list:

1. Available literature was evaluated to identify studies that could be used to develop a conservative ERV. If appropriate studies were found, the relevant, most sensitive ecological effect was used to develop the ERV. ERVs were developed in accordance with EPA guidance (EPA 1997b). This was relevant when a high or low TRV was not established by the BTAG (Navy 1999) and sufficient literature data were available to evaluate potentially significant ecological effects. If data were available for only a single effects level (no observable adverse effects level or lowest observable effects level), the ERV for the other effects level was estimated by multiplying or dividing the ERV by a factor of 10, as appropriate.

2. The existing literature was evaluated to determine whether the ERV for a similar chemical could be used as a surrogate when insufficient information existed to develop a specific ERV for the ecological COPC and endpoint. If the literature indicated similar effects and mechanisms of actions for the chemicals, surrogate ERVs were used for the preliminary ecological effects evaluation conducted in the ERA.

3. The ecological COPC and endpoint were evaluated on a qualitative basis if an ERV or surrogate ERV could not be developed. Available literature information, ecological COPC concentrations and distribution, and other information were used to arrive at a conclusion concerning potential ecological effects.

High and low ERVs and TRVs used in risk calculations for each receptor endpoint are presented in Tables G-4 through G-11.

G.1.2.2.5 Exposure Pathway Evaluation

Complete exposure pathways were evaluated for OU-2B sites, based on the fate and transport properties of each ecological COPC, including food chain transfer in the food web postulated to exist at each site. Complete exposure pathways were identified to focus the quantitative evaluation of toxicity on those contaminants that can reach ecological receptors. For an exposure pathway to be considered complete, an ecological COPC must be able to travel from the source to ecological receptors and to be taken up by the receptors through one or more exposure routes. As required by EPA and DTSC, the ERA assumes that all existing buildings and pavement are removed and that the underlying soil provides suitable habitat for highertrophic-level receptors. The ERA assesses groundwater expression as a complete exposure pathway only if the potential exists for the groundwater located beneath the site to reach the Seaplane Lagoon, Oakland Inner Harbor, or the Seaplane Lagoon.

The ecological CSM for the OU-2B sites is based on site media, potential food chain transport pathways, assessment endpoints, and measurement endpoints associated with each assessment endpoint. The ecological CSM supports selection of completed exposure pathways that present the greatest potential risk of adverse effects. A generic ecological CSM for OU-2B sites is presented in Figure G-6. The CSM depicts the guilds chosen as assessment endpoints as well as those species representing those endpoints. Additionally, other guilds not chosen as assessment endpoints are presented in the CSM because they represent a food source for the assessment endpoints.

G.1.2.2.6 Selection of Assessment and Measurement Endpoints

EPA defines an assessment endpoint as an "explicit expression of an environmental value to be protected" (EPA 1997a). Ecological resources may be considered valuable when (1) their absence would significantly impair ecosystem function; (2) they provide critical resources, such as habitat or fisheries; and (3) they are perceived by humans as being valuable such as endangered species. An assessment endpoint should define both the valuable ecological entity at each site and a characteristic of the entity to protect, such as reproductive success or production per unit area.

Unlike a human health risk assessment, which evaluates only one species, the ERA involves multiple species with different degrees of exposure and toxicological responses. For the purpose of a CERCLA ERA, investigations should focus on endpoints most likely to be affected, given the fate and transport mechanisms of the chemicals involved, ecotoxicological properties of the chemicals, habitats at each site (and future use), and potential ecological receptors (EPA 1997a).

OU-2B sites consist primarily of developed and paved areas within Alameda Point; therefore, suitable wildlife habitats are limited. This modified ERA, however, assumes that all pavement and buildings are removed and that soil is fully exposed. Based on EPA guidance, three generic assessment endpoints were selected for OU-2B to evaluate potential ecological risk at the sites. The following paragraphs summarize the assessment endpoints selected and the rationale for selection. Plants and invertebrate populations were not selected as assessment endpoints because of the urban habitat at the sites. The habitat available for most species is expected to remain minimal.

Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area. Literature data indicate that ecological COPCs associated with Alameda Point can cause reproductive impairment, reduced growth, altered behavior, various physiological effects, mortality, mutagenic, teratogenic, and other effects on mammals (Peterle 1991; EPA 1975). Small mammals, such as the California ground squirrel *(Citellus* *beecheyi)* and various voles, are secondary consumers that provide a major food source for upper-trophic-level consumers such as raptors. Adverse effects on the small mammal community of Alameda Point could result in a reduction in the amount of food available to and corresponding reductions in, populations of predators. The small mammal community, was therefore, considered to be an ecological value to be protected.

Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area. Literature data indicate that ecological COPCs associated with Alameda Point can cause reproductive impairment, reduced growth, altered behavior, various physiological effects, mortality, teratogenic, and other effects on passerine species (Beyer and others 1996; Peterle 1991; EPA 1995; Hoffman and others 1996). Passerines, such as the Alameda song sparrow *(Melospiza melodia pusillula)* and the American robin *(Turdus migratorius),* are secondary consumers that provide a food source for upper trophic level predators. In addition, some small birds, such as songbirds, are considered to be important and worthy of protection for aesthetic or other functional reasons. Adverse effects on the passerine community at Alameda Point could result in a reduction of food available to and corresponding reductions in populations of predators; therefore, the passerine community was considered to be an ecological value to be protected.

Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area. Literature data indicate that ecological COPCs associated with Alameda Point can cause reproductive impairment, reduced growth, altered behavior, various physiological effects, mortality, teratogenic, and other effects on birds (Beyer and others 1996; Peterle 1991; EPA 1995; Hoffman and others 1996). The facility has a strong presence of raptors such as red-tailed hawks *(Buteo jamaicensis),* Swainson's hawk *(Buteo swainsoni),* and other species. At least one of these, the northern harrier *(Circus cyaneus),* is a species of special concern. Raptors are the major tertiary consumers at the sites and are strongly susceptible to effects of bioaccumulating chemicals. A decrease in the raptor population at Alameda Point would be undesirable because of the effects of the loss of predation on prey; therefore, the raptor population was considered to be an ecological value to be protected.

Assessment endpoints usually are not amenable to direct measurement. Instead, measurement endpoints that are related to assessment endpoints must be developed. EPA defines a measurement endpoint as "a measurable ecological characteristic that is related to the valued characteristic chosen as the assessment endpoint and is a measure of biological effects (e.g., mortality, reproduction, growth)" (EPA 1997a). Measurement endpoints can include measures of exposure or measures of effect. They are frequently numerical expressions of observations that can be compared statistically to a control or reference site or scientific study to detect adverse responses to an ecological COPC. Each measurement endpoint correlates directly with one of the defined assessment endpoints and was based on available literature mechanisms of toxicity.

The following generic measurement endpoints for Alameda Point were selected based on ecotoxicity data for ecological COPCs found at each site. Each measurement endpoint corresponds directly to an assessment endpoint. Each generic measurement endpoint (1) is based on populations or communities present or potentially present at each site, (2) is amenable to evaluation based on literature research, and (3) can be used to infer information about the related assessment endpoint. The following measurement endpoints were used to evaluate potential ecological impacts to assessment endpoints. The organisms identified here as measurement endpoints were selected based on their ability to represent more ecologically relevant endpoints that would be exposed at the sites.

Reproductive or Physiological Impacts to the California Ground Squirrel. The California ground squirrel was used as a surrogate to represent the small mammal population associated with each site. Potential reproductive or physiological impacts were evaluated against existing, consensus TRVs. For ecological COPCs that have not been assigned an existing, consensus TRV, ERVs were identified or developed, as described in Section G.1.2.2.4 of this appendix, or evaluated on a qualitative basis if information in the literature was insufficient to support ERV development. A conservative daily dose was calculated based on site-specific ecological COPC concentrations and natural history information about the California ground squirrel (Linsdale 1946). A hazard quotient (HQ) was developed by dividing the daily dose by the appropriate TRV or ERV for each ecological COPC.

Reproductive or Physiological Impacts to the Alameda Song Sparrow and the American Robin. The Alameda song sparrow and the American robin were used as surrogates to represent the passerine population associated with each site. Both species were assessed because the Alameda song sparrow resides in a more estuarine habitat and is a special status species, and the American robin resides in a more terrestrial or upland habitat. Potential reproductive or physiological impacts were evaluated against existing, consensus TRVs. For ecological COPCs that have not been assigned an existing, consensus TRV, ERVs were identified or developed, as described in Section G.1.2.2.4 of this appendix, or evaluated on a qualitative basis if information in the literature was insufficient to support ERV development. A conservative daily dose was calculated based on site-specific ecological COPC concentrations and natural history information about the Alameda song sparrow or the American robin (EPA 1993). An HQ was developed by dividing the daily dose by the appropriate TRV or ERV for each ecological COPC.

Reproductive or Physiological Impacts to the Red-tailed Hawk. The red-tailed hawk was used as a surrogate to represent the raptor population associated with each site. Potential reproductive or physiological impacts were evaluated against existing, consensus TRVs. For ecological COPCs that have not been assigned an existing, consensus TRV, ERVs were identified or developed, as described in Section G.1.2.2.4 of this appendix, or evaluated on a qualitative basis if information in the literature was insufficient to support ERV development. A conservative daily dose was calculated based on site-specific ecological COPC concentrations and natural history information about the red-tailed hawk (EPA 1993). An HQ was developed by dividing the daily dose by the appropriate TRV or ERV for each ecological COPC.

Table G-12 presents generic assessment and associated measurement endpoints.

G.1.2.3 Exposure Estimates and Risk Evaluation

The exposure estimate and risk calculation step results in a conservative estimate of potential risk to the selected measurement endpoints. For each measurement endpoint and ecological COPC, a conservative estimate of the dose to an organism was developed using soil EPCs and either sitespecific or literature-derived exposure parameters. Using risk calculations, doses were compared to TRVs or ERVs to evaluate potential risks to each ecological receptor. The following sections describe the development of exposure estimates and risk calculations.

G.1.2.3.1 Development of Exposure Estimates

It is important that risk is conservatively estimated with a screening-level ERA to ensure that the assessment does not indicate insignificant risk when a significant risk exists. The screening-level ERA for the OU-2B sites indicated that risk to ecological receptors was possible at the sites based on the conservative assumptions that were used. The urban nature of the sites, however, precluded the collection of site-specific tissue samples that could be used to reduce the uncertainty in the baseline ERA. In the absence of site- or species-specific tissue data, a modified ERA based on the use of more average exposure parameters was deemed appropriate for the OU-2B sites. These average exposure parameters were used to provide a more realistic estimate of potential risk to ecological receptors. The following assumptions were used for the exposure assessment to calculate a conservative dose to each receptor.

Site Use Factors (SUF). All species considered in the ERA were assumed to live and feed within each site at all times.

Bioavailability. All ecological COPCs were assumed to be 100 percent bioavailable for all trophic levels and species.

Body Weight and Food Ingestion. The average body weight indicated in the literature was used to calculate an ingestion rate based on the formulas presented in Nagy 2001.

Bioconcentration and Bioaccumulation Factors. Soil-to-plant and soil-to-soil invertebrate bioconcentration factors (BCF) were obtained from EPA 1999b or calculated using the following formulas also presented by EPA 1999b:

$$\log BCF_{soil\text{-}to\text{-}invert} = (0.819)(\log K_{ow}) - 1.146 \quad \text{(G-1)}$$

$$\log BCF_{soil\text{-}to\text{-}plant} = 1.588 - (0.578)(\log K_{ow}) \quad \text{(G-2)}$$

where Log = Logarithm

$BCF_{soil\text{-}to\text{-}invert}$ = Bioconcentration factor for uptake of constituent from soil to invertebrate tissue

$BCF_{soil\text{-}to\text{-}plant}$ = Bioconcentration factor for uptake of constituent from soil to plant tissue

Table G-13 presents the plant and soil invertebrate BCFs.

BCFs for uptake of chemicals from food items to mammal tissues also were based on EPA protocol (1999b). The ecological COPC-specific biotransfer factor for mammals (Ba_{mammal}) was based upon studies of beef cattle ingesting food items. The Ba_{mammal} for inorganic chemicals are presented by EPA 1998, and the Ba_{mammal} for organic chemicals were calculated using the following Travis and Arms (1988) correlation equation, which also is presented by EPA 1999b:

$$\log Ba_{mammal} = -7.6 + \log K_{ow} \qquad \text{(G-3)}$$

The $BCF_{soil\text{-}to\text{-}mammal}$ and the $BCF_{food\ item\text{-}to\text{-}mammal}$ were then calculated from the following equations (EPA 1999b):

$$BCF_{soil\text{-}to\text{-}mammal} = (Ba_{mammal})\ (IR_{soil}) \qquad \text{(G-4)}$$

$$BCF_{food\ item\text{-}to\text{-}mammal} = (Ba_{mammal})\ (IR_{food\ item}) \qquad \text{(G-5)}$$

where

$BCF_{soil\text{-}to\ mammal}$ = Bioconcentration factor for uptake of constituent from soil to mammal tissue (based on milligram per kilogram dry weight [mg/kg-DW] soil to milligram per kilogram fresh weight [mg/kg-FW] mammal tissue [unitless] [EPA 1999b])

$BCF_{food\ item\text{-}to\text{-}mammal}$ = Bioconcentration factor for uptake of constituent from food item tissues to mammal tissues (based on mg/kg-DW soil to mg/kg-DW plant tissue [unitless]).

IR_{soil} = Incidental soil ingestion rate

$IR_{food\ item}$ = Ingestion rate of food item

Table G-14 presents the Ba_{mammal} values and the calculated mammal BCFs used in exposure estimate calculations, which are discussed in the following text.

Dietary Composition. The diet of each of the receptors was based on the percentages of dietary items, as reported in the literature.

Ecological COPC Concentration. The EPC used in the evaluation was the lower of the maximum detected concentration or the UCL95 concentration.
Exposure was assessed in the context of the following linear food chains: SoiloInvertebrates

and PlantsoCalifornia ground squirreloRed-tailed hawk SoiloInvertebrates and

PlantsoAlameda song sparrow or American robin

These food chains were used in this modified ERA to evaluate potential ecological effects on small mammals, passerines, and raptors. The postulated food web for Alameda Point is presented in Figure G-5.

The model presented in the following equations is adequate to estimate daily doses to various receptors in a modified ERA.

Ground squirrel dose (mg/kg-day) =

$$\frac{(C_{soil})(IR_{soil})(C_{invert})(IR_{invert}) + + C_{plant} IR_{plant}}{(SUF)\ BW} \quad \text{(G-6)}$$

Alameda song sparrow dose (mg/kg-day) =

$$\frac{(C_{soil})(IR_{soil})(C_{invert})(IR_{invert}) + + C_{plant} IR_{plant}}{BW} \quad \text{(G-7)}$$

American robin dose (mg/kg-day) =

$$\frac{(C_{soil})(IR_{soil})(C_{invert})(IR_{invert}) + + C_{plant} IR_{plant}}{(SUF)\ BW} \quad \text{(G-7)}$$

Red-tailed hawk dose (mg/kg-day) =

$$\frac{(C_{ground\ squirrel})(IR_{ground\ squirrel})(C + _{soil})(IR_{soil})}{BW} \quad \text{(G-8)}$$

where BW = Body weight

C_{soil} = EPC of chemical in soil (milligram per kilogram [mg/kg])

C_{invert} =$(C_{soil})(BCF_{soil-to-invert})$ (mg/kg- FW) (EPA 1999b)

C_{plant} = $(C_{soil})(BCF_{soil-to-plant})$ (0.12) (mg/kg-FW) (EPA 1999b)

(0.12 is a default value to convert the plant concentration from dry weight to fresh weight and is presented by EPA [1999b]. This value is an average based on 80 to 95 percent water content in herbaceous plants and nonwoody plant parts.)

$C_{ground\ squirrel} =$ $[(C_{invert})(FCM3/FCM2)(F_i) + (C_{plant})(BCF_{plant\text{-}to\text{-}mammal})(F_p)$

$BCF_{plant\text{-}to\text{-}mammal} =$ Bioconcentration factor for uptake of constituent from plant tissues to mammal tissues (based on mg/kg-DW soil to mg/kg-DW plant tissue [unitless])

$(0.12)+ {}_{(Csoil)(BCFsoil\text{-}to\text{-}mammal)](mg/kg)]}$ (EPA 1999b)

FCM^3/FCM^2 = Food-chain multiplier, which models an ecological COPC concentration in a predator item (FCM^3), such as the California ground squirrel, from the ingestion of a prey item (FCM^2), such as a soil invertebrate (unitless). Table G-15 presents the FCMs as presented in EPA 1999b. Fi =

The fraction of the ground squirrel diet that consists of invertebrates F_p = The fraction of

the ground squirrel diet that consists of plants

IR = Ingestion rate [the amount of prey items (including inverts, plants, and ground squirrel) and soil ingested per day] (mg/kg-day)

SUF = Site use factor

Values for the exposure factors for each vertebrate receptor are presented in Table G-16. The following overall procedures and assumptions are associated with the exposure estimates for each receptor.

Small Mammal and Passerine Endpoints

- Small mammal and passerine receptors were assumed to have a diet consisting of a mixture of plants and invertebrates. For small mammals, diet consisted of 80 percent vegetation and 20 percent invertebrates; for passerines, diet consisted of 50 percent vegetation and 50 percent invertebrates. The primary source of the dietary information was collected from the Cal/EPA (2000).

- The EPC is the ecological COPC soil concentration used in risk calculations. Multiplying the EPC by the appropriate plant and invertebrate BCF and natural history information on ingestion rates and body weights for the receptors derived the dose for each ecological COPC (See Equations G-6 and G-7). The dose was calculated in mg/kg-day for each ecological COPC.

- For 4,4'-dichlorodiphenyltrichloroethane (DDT); 4,4'-dichlorodiphenyldichloroethane (DDD); and 4,4'-dichlorodiphenyldichloroethene (DDE), the EPCs were summed and evaluated as total DDT (DDTt). The DDTt value was used in calculations as the soil concentration.

- All PAH compounds were segregated into low molecular weight (LMW) and high molecular weight (HMW) PAH categories. LMW PAHs are defined as measured PAHs with a molecular weight below 200 atomic mass units (amu) and include acenaphthene, anthracene, fluorene, naphthalene, 2-methylnaphthalene, and phenanthrene. HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 amu and include benzo(a)fluorene, benzo(b)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. The EPC for each category was calculated by summing the individual compound concentrations detected in each medium and area. Total LMW and HMW PAH concentrations were used in the calculations as the soil concentration.

- For PCB compounds, the EPCs of detected Aroclors were summed to develop a total PCB concentration, which was used in the calculations as the soil concentration.

Raptor Endpoints

- Raptors at each site were assumed to have a diet consisting exclusively of the California ground squirrel, which is considered to be the most conservative diet for the raptor. This diet was selected based on the screening-level ERA, which estimated that the concentrations of chemicals in small mammals were higher than passerines.

- The EPC is the ecological COPC soil concentration used in risk calculations. Multiplying the EPC by the soil and ground squirrel concentrations and natural history information on ingestion rates and body weights for the receptors derived the dose for each ecological COPC (See Equation G-8). The dose was calculated in mg/kg-day for each ecological COPC.

- Multiplying the EPC by the appropriate plant and invertebrate BCF and natural history information on ingestion rates and body weights for the receptors derived the dose for each ecological COPC. The dose was calculated in mg/kg-day for each ecological COPC.

- The EPCs for DDT, DDD, and DDE were summed and evaluated as DDTt. The DDTt value was used in calculations as the soil EPC.

- PAH compounds were segregated into LMW and HMW PAH categories defined previously. The soil concentration for each category was calculated by summing the individual EPCs in each medium and area. Total LMW and HMW PAH concentrations were used in the calculations as the soil concentration.

- For PCB compounds, the EPCs of each detected Aroclor were summed to develop a total PCB concentration, which was used in the calculations as the soil concentration.

Depending on ecological COPCs identified at each site, additional site-specific considerations were used, where appropriate.

G.1.2.3.2 Risk Calculations

Risk calculations were prepared for each receptor based on exposure assumptions for the individual receptor. Risk calculations for terrestrial receptors consist of dividing the calculated dose by the appropriate ERV or TRV for each receptor and ecological COPC, deriving an HQ. Risk calculations for marine receptors consist of applying a dilution factor of 10 to the calculated EPC and then dividing this value by the saltwater screening criteria, thus deriving an HQ. HQs greater than 1.0 indicate potential risk to the assessment endpoint being evaluated. Depending on the ecological COPCs present at a site, risk calculations were based on the following assumptions.

Small Mammal Endpoint

- The calculations for total PCBs were based on the TRV for Aroclor 1254. No TRV was identified or developed for Aroclor 1260.

- No specific TRVs or ERVs were identified for the individual PAHs. The TRV for naphthalene was used as a surrogate for the LMW PAHs, and the benzo(a)pyrene TRV was used as a surrogate for the HMW PAHs. These surrogates were based on Navy guidance (1998b).

- No specific TRV or ERV was identified for the metal silver; therefore, this chemical was qualitatively evaluated (QE).

- No specific TRV or ERV was identified for the SVOC n-nitrosodiphenylamine; therefore, this chemical was QE.

- No specific TRVs or ERVs were identified for the VOCs 2-butanone, carbon disulfide, and ethylbenzene; therefore, these chemicals were QE.

Passerine and Raptor Endpoints

- The calculations for total PCBs were based on the TRV for Aroclor 1254. No TRV was identified or developed for Aroclor 1260.

- No specific TRVs or ERVs were identified for the metals beryllium, cobalt, and silver; therefore, these chemicals were QE.

- No specific TRVs or ERVs were identified for the LMW and HMW PAH ecological COPCs; therefore, these chemicals were QE.

- No specific TRVs or ERVs were identified for the SVOCs n-nitroso-diphenylamine and pentachlorophenol; therefore, these chemicals were QE.

- No specific TRVs or ERVs were identified for the VOCs 1,1,1-trichloroethane (TCA), 2-butanone, acetone, benzene, carbon disulfide, chloroform, ethylbenzene, toluene, and xylene; therefore, these chemicals were QE.

G.1.2.4 Evaluation of Assessment Results

Using the high and low TRV values to evaluate ecological endpoints bounds the estimate of risk to each endpoint. The high TRV is the lowest reported dose in the literature at which adverse effects are known to occur and represents an upper bounding limit. The low TRV is the highest reported dose in the literature at which adverse effects are known not to occur and represents the lower bounding limit. Based on this information, HQ results using the high and low TRV were evaluated. Generally, concentrations of ecological COPCs with calculated HQs less than 1.0 based on the low TRV would not be considered to pose an appreciable risk to ecological receptors, and HQs greater than 1.0 based on the high TRVs may pose an unacceptable level of risk and require evaluation of the need for remedial actions at a site.

Following calculation of the low and high HQs, further assessment of the potential risk was conducted using a weight-of-evidence approach. This evaluation was conducted as follows.

1. If both HQ values for a constituent were below 1.0, then no potential risk to the ecological endpoint was anticipated.

2. If one or both bounding-limit HQs exceeded 1.0, then the constituent was further compared to calculated background or ambient HQs.

3. Additional factors such as frequency of detection, distribution, concentration, and absorption potential of the chemical also were used to evaluate risk.

G.1.2.5 Uncertainties

The ERA process involves a large number of uncertainties and extrapolations to evaluate potential risk to ecological receptors. Uncertainties and extrapolations associated with the evaluation of each site were identified and explained so that risk managers can make risk management decisions with an understanding of how the HQs were developed. Many of the assumptions in the screening-level ERA process are conservative and result in overestimates of site-specific parameters. The following uncertainties apply to all sites for the modified ERA.

SUFs. The risk calculations assumed that all receptors lived and fed in the area of each site at all times. This will not be true for the upper-trophic-level receptors that have large foraging ranges. Sites 3, 4, 11, and 21, are 50, 14, 5.3, and 7 acres in size, respectively. Based on the assumption of 100 percent site use, the exposure is overestimated for receptors, such as the red-tailed hawk, that feed over a range of about 200 acres (EPA 1993). The actual ingestion of ecological COPCs from each site, therefore, will be much less than the value used in the risk calculations.

Dietary Composition. The percent composition and type of prey ingested by the endpoint receptors were based on nonsite-specific literature studies. Additionally, the models were simplified to assume a limited diet, such as the raptor diet, consisting of 100 percent California ground squirrels. Receptors at the facility may use different food sources or have different percentages of available food sources.

Bioavailability. All ecological COPCs were assumed to be 100 percent bioavailable to all receptors. Depending on the ecological COPCs and receptor, bioavailability may be significantly less than 100 percent.

Development of TRVs. TRVs and ERVs used in risk calculations were derived from literature studies. These studies were not conducted on the receptors used in this assessment. TRVs and ERVs were extrapolated using uncertainty factors to account for differences between species. The effect of this uncertainty cannot be estimated.

QEs of Ecological COPCs. Studies were not available to develop TRVs for a number of the constituents and measurement endpoints. The potential effects of these ecological COPCs were evaluated on a qualitative basis, relying heavily on professional judgment. The potential exists that these QEs may not have adequately judged the potential effects of these ecological COPCs.

Surrogate TRVs. The use of surrogate TRV values for some compounds, such as the DDT TRV for other chlorinated pesticides, increases the uncertainty associated with the evaluation. While every effort was made to select conservative TRVs, the effect of this uncertainty cannot be estimated.

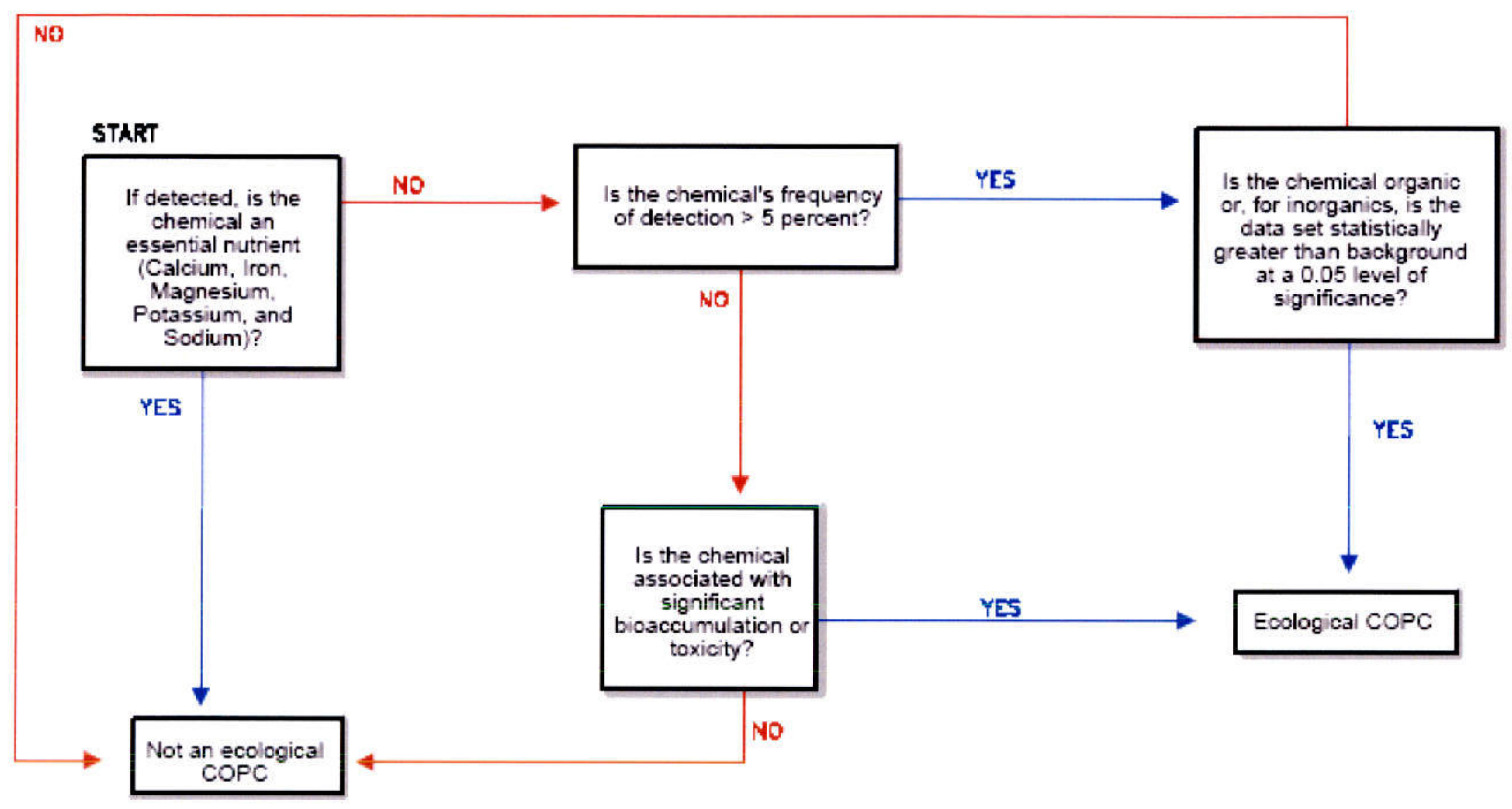
Bioconcentration Factors. The use of the $\log K_{ow}$ to calculate the $_{\text{Bamammals}}$ and the BCFs for receptors and food items can overestimate the uptake of organic chemicals into the tissues of organisms and plants.

Background Concentrations. Another consideration is risk associated with background levels of metals and ambient concentrations of pesticides and PAHs that are not specific to the various sites but are ubiquitous across Alameda Point. Documentation of background soil and groundwater is presented in Appendix E of the RI. To place site-specific risks in the proper context, the risks associated with background and ambient concentrations of chemicals were considered. Areas of the installation with geologically similar soils that represent a single background data set were designated as the pink, blue, or yellow areas. These areas correspond with a particular fill event. Sites 3, 11, and 21 are designated to be in the pink background area, and Site 4 is designated to be in the blue background area. Additionally, groundwater samples from background areas of Alameda also were collected. These background samples collected for Alameda underwent statistical analysis, the results of which are presented in Tables G-17 (the pink soil background area), G-18 (the blue soil background area), and G-19 (the groundwater background). For soils, the background or ambient concentration risks, based on the modified ERA exposure assumptions, are presented in Tables G-20 and G-21 for each receptor.

FIGURES

FIGURE G-1
OPERABLE UNITS, CERCLA SITES AND BUFFER ZONES

Ecological Risk Assessment for Sites 3, 4, 11, and 21



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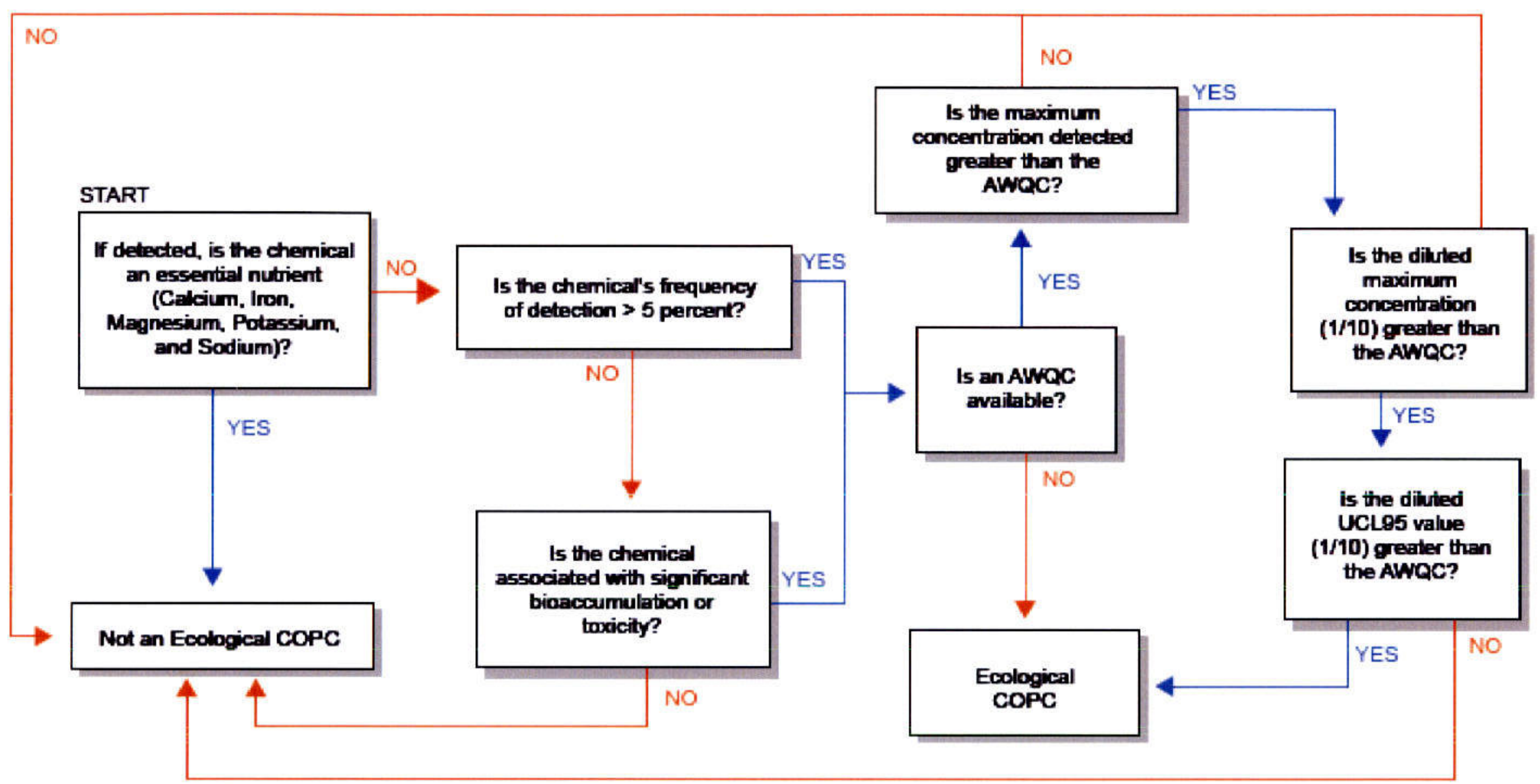
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE G-2
DECISION TREE FOR ECOLOGICAL COPC SELECTION FOR SURFACE SOILS AND RHIZOSPHERE
Ecological Risk Assessment for Sites 3, 4, 11, and 21

LEGEND

COPC CHEMICAL OF POTENTIAL CONCERN



LEGEND

AWQC — AMBIENT WATER QUALITY CRITERIA
COPC — CHEMICAL OF POTENTIAL CONCERN
UCL95 — 95TH PERCENTILE UPPER CONFIDENCE LIMIT ON THE ARITHMETIC MEAN

Tetra Tech EM Inc.

Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE G-3
DECISION TREE FOR ECOLOGICAL COPC SELECTION FOR GROUNDWATER
Ecological Risk Assessment for Sites 3, 4, 11, and 21

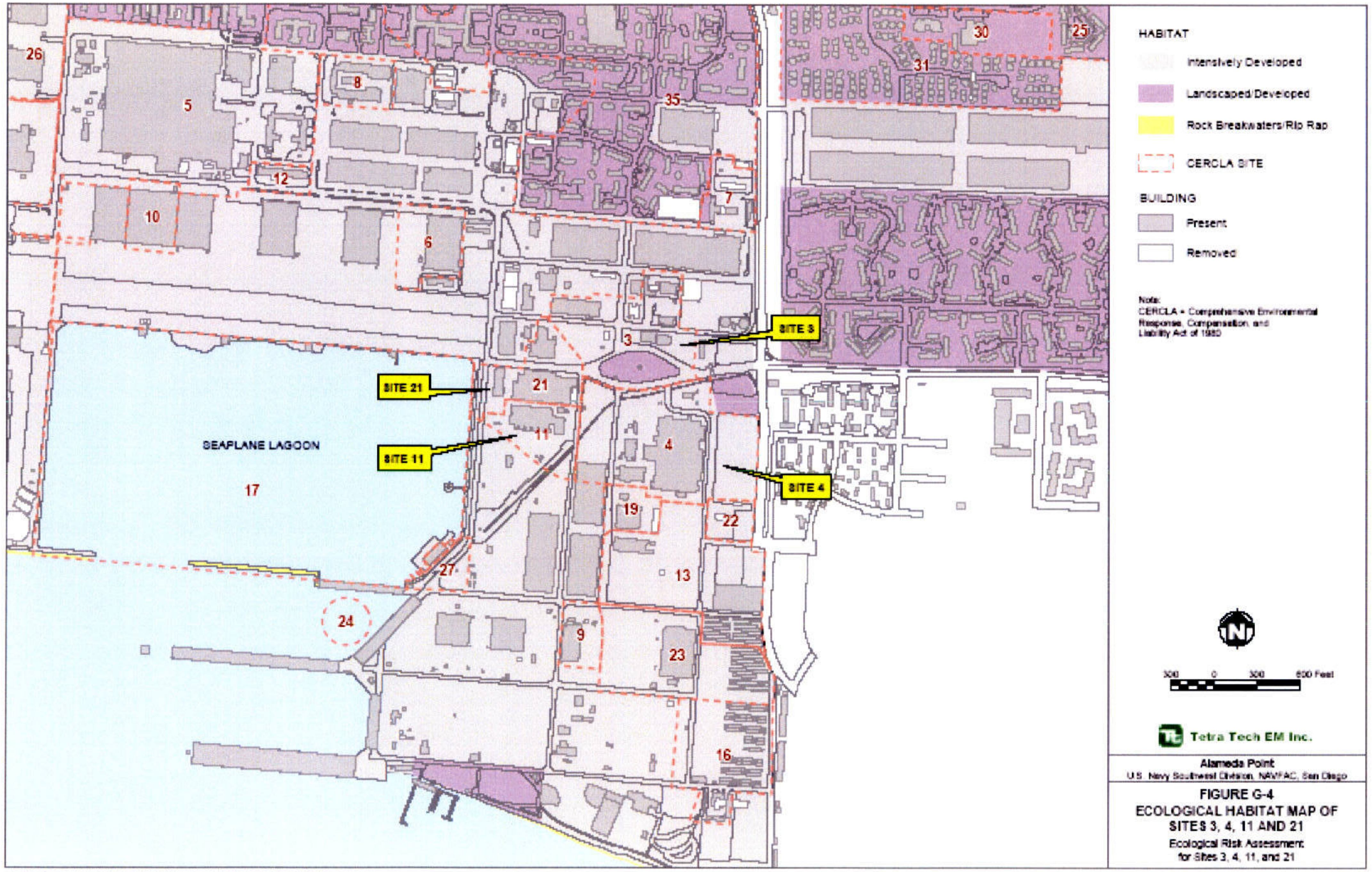


FIGURE G-4
ECOLOGICAL HABITAT MAP OF SITES 3, 4, 11 AND 21
Ecological Risk Assessment for Sites 3, 4, 11, and 21

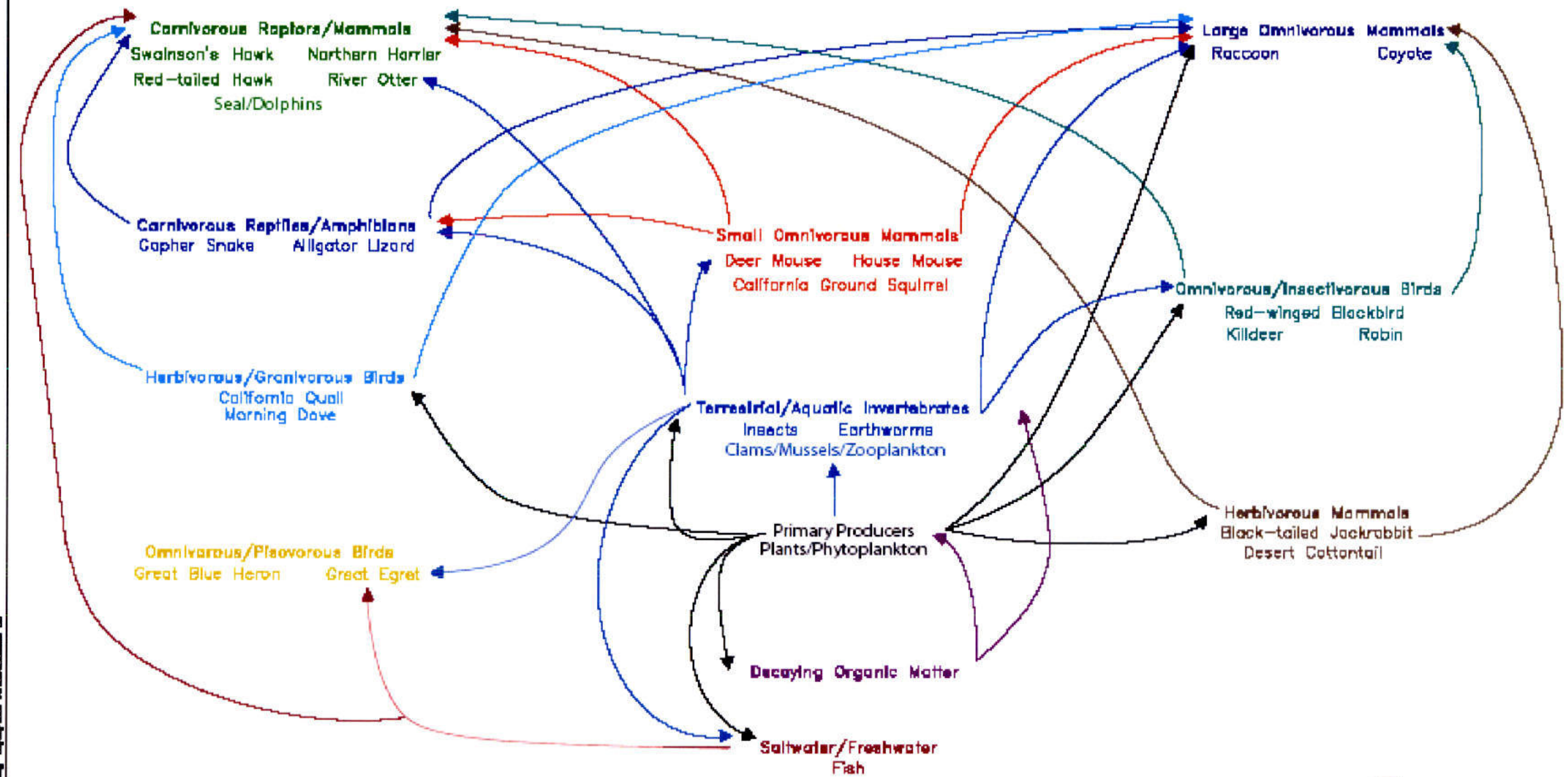


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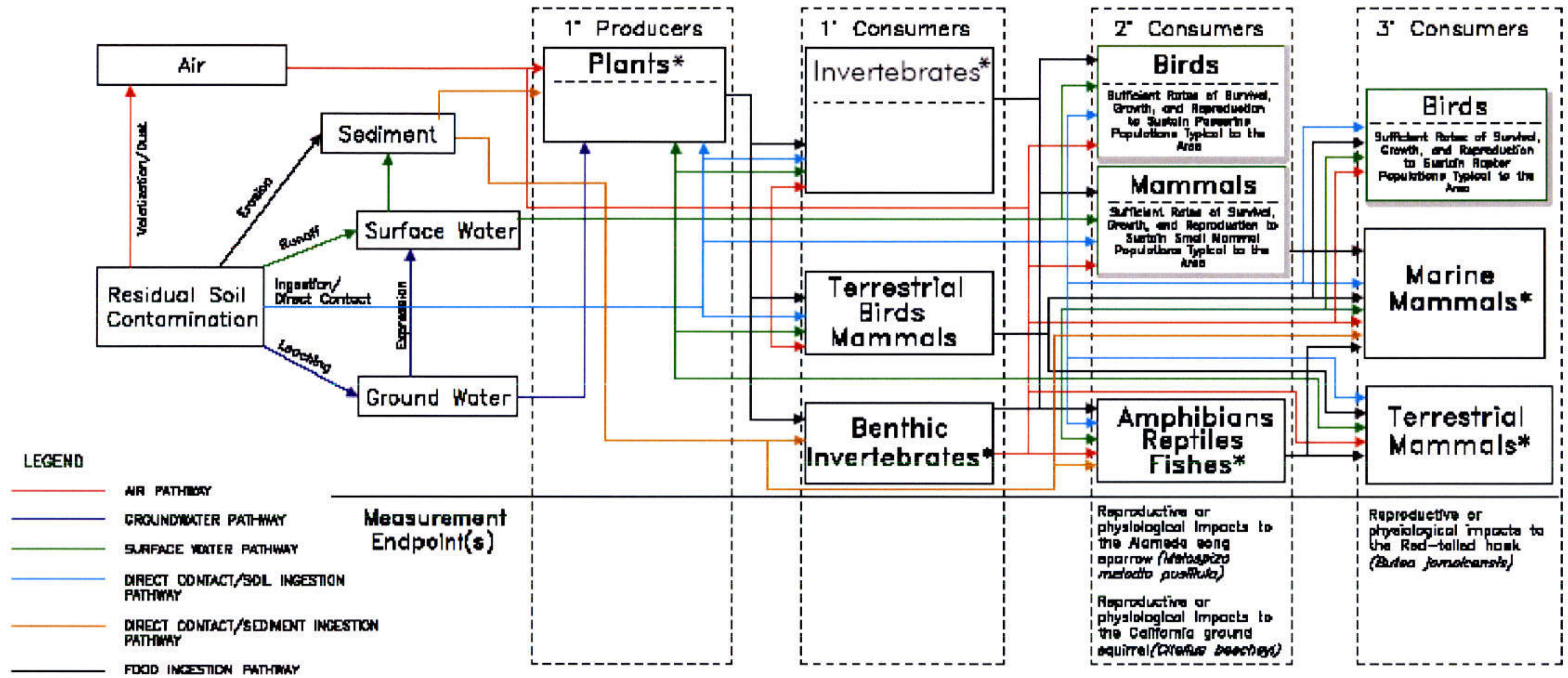
FIGURE G-5
TERRESTRIAL FOOD WEB
Ecological Risk Assessment for
Sites 3, 4, 11, and 21



LEGEND

- AIR PATHWAY
- GROUNDWATER PATHWAY
- SURFACE WATER PATHWAY
- DIRECT CONTACT/SOIL INGESTION PATHWAY
- DIRECT CONTACT/SEDIMENT INGESTION PATHWAY
- FOOD INGESTION PATHWAY
- ASSESSMENT ENDPOINTS

1° PRIMARY

2° SECONDARY

3° TERTIARY

* THESE CONSUMERS ARE PRESENT AT ALAMEDA POINT BUT WERE NOT ASSESSED AS AN ENDPOINT

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Alameda Point
U.S. Navy Southwest Division, NAVFAC, San Diego

FIGURE G-6
GENERIC ECOLOGICAL CONCEPTUAL SITE MODEL
Ecological Risk Assessment for Sites 3, 4, 11, and 21

TABLES

TABLE G-1: SPECIAL STATUS SPECIES – PLANTS, FISH, REPTILES, AND MAMMALS

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

	Common Name	Scientific Name
Plants[a]	Contra Costa goldfields	*Lasthenia conjugens*
	Santa Cruz tarplant	*Holocarpha macradenia*
	Kellogg's horkelia	*Horkelia cuneata sericea*
	Point Reyes bird's beak	*Cordylanthus maritimus palustris*
	Adobe sanicle	*Sanicula maritima*
Fish[b]	Chinook salmon, winter run	*Oncorhynchus tshawytscha*
	Longfin smelt	*Spirinchus thaleichthys*
	Delta smelt	*Hypomesus transpacificus*
	Coho salmon	*Oncorhynchus kisutch*
Reptiles[c]	Alameda whipsnake	*Masticophis lateralis euryxanthus*
Mammals[c]	Saltmarsh harvest mouse[d]	*Reithrodonomys raviventris*
	San Francisco dusky-footed woodrat	*Neotoma fuscipes annectens*
	Townsend's western big-eared bat	*Plecotus townsendii townsendii*
	California mastiff bat	*Eumops perotis californicus*
	Northern (Steller) sea lion	*Eumetopias jubatus*
	Saltmarsh wandering shrew	*Sorex vagrens halicoetes*
	Alameda Island mole	*Scapanus latimanus parvus*

Notes:

a Rare plant species listed as potentially occurring at Alameda Point. These plants were not identified during vegetation surveys performed in 1995 and 1997.

b Rare fish species that may occur in the open water areas adjacent to Alameda Point.

c Special status species that may occur at Alameda Point.

d In 1995, a survey for the saltmarsh harvest mouse was conducted in the West Beach Landfill Wetland and in the Runway Area Wetland to identify potential receptors for evaluation in ecological risk assessments being conducted by the Navy for the IR program. No individuals were captured during these surveys of the West Beach Landfill Wetland and Runway Area Wetland.

Reference:

U.S. Fish and Wildlife Service (FWS). 1993. Listed and Proposed Endangered and Threatened Species and Candidate Species that May Occur in the Area of the Proposed Closure of Naval Air Station, Alameda, Alameda County, California (1-1-94-SP-192, December 31, 1993). Enclosure attached to letter from Dale A. Pierce, FWS, to John H. Kennedy, U.S. Department of Navy.

TABLE G-2: SPECIAL STATUS SPECIES – BIRDS

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

	Common Name	Scientific Name
Birds[a]	California least tern	*Sterna antillarum browni*
	American peregrine falcon	*Falco peregrinus anatum*
	Western snowy plower, coastal population	*Charadrius alexandrinus nivosus*
	Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*
	Alameda song sparrow	*Melospiza melodia pusillula*
	Double-crested cormorant, rookery sites	*Phalacrocorax auritus*
	California black rail	*Laterallus jamaicensis coturniculus*
	California clapper rail	*Rallus longirostris obsoletus*
	Caspian tern, nesting colonies	*Sterna caspia*
	Forster's tern, nesting colonies	*Sterna forsteri*
	California brown pelican, nesting colony	*Pelecanus occidentalis californicus*
	California horned lark	*Eremophila alpestris actia*
	Loggerhead shrike	*Lanius ludovicianus*
	California gull	*Larus californicus*
	Northern harrier, nesting sites	*Circus cyaneus*
	Merlin	*Falco columbarius*
	Long-billed curlew, breeding	*Numenius americuanus*
	Burrowing owl, burrowing sites	*Athene cunicularia*
	Common loon, breeding	*Gavia imer*
	Fork-tailed storm petrel, rookery	*Ocanodroma furcata*
	American white pelican, nesting colony	*Pelicanus erythrorhynchos*
	Clark's grebe	*Aechmophorus clarkii*
	Western grebe	*Aechmophorus occidentalis*
	Great blue heron, rookery	*Ardea herodias*
	Great egret, rookery	*Casmerodius albus*
	Snowy egret, rookery	*Egreta thula*
	Black-crowned night heron, rookery	*Nycticorax nycticorax*
	Black-shouldered kite, nesting	*Elanus caeruleus*
	Common murre, nesting colony	*Uria aalge*

Notes:

[a] Special status bird species and associated sensitive habitats (such as breeding, nesting, and rookery sites) that occur or may occur at Alameda Point.

Reference:
U.S. Fish and Wildlife Service (FWS). 1993. Listed and Proposed Endangered and Threatened Species and Candidate Species that may occur in the Area of the Proposed Closure of Naval Air Station, Alameda, Alameda County, California (1-1-94-SP-192, December 31, 1993). Enclosure attached to letter from Dale A. Pierce, FWS, to John H. Kennedy, U.S. Department of Navy.

TABLE G-3: TERRESTRIAL HABITAT SUMMARY FOR OU-2B SITES

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Habitat Type	Dominant Vegetation	Observed Animal Species	Relative Occurrence
Site 3			
Urban/Ornamental Landscapes	Ryegrass (*Lolium* spp.); Common plantain (*Plantago* sp.); Fennel (*Foeniculum vulgare*); Sweetclover (*Melilotus* sp.)	Canada Goose (*Branta canadensis*); American robin (*Turdus migratorius*); House sparrow (*Passer domesticus*); Mourning dove (*Zenaida macrowra*)	Common
Site 4			
Urban/Ornamental Landscapes	None (paved)	None	NA
Site 11			
Urban/Ornamental Landscapes	None (paved)	None	NA
Site 21			
Disturbed Areas	None (paved)	None	NA

Note:

NA Not applicable

TABLE G-4: HIGH TOXICITY REFERENCE VALUES FOR THE CALIFORNIA GROUND SQUIRREL (CITELLUS BEECHEYI)

Ecological Risk Assessment For Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based high TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted high TRV (mg/kg-day)
Metals						
Aluminum	1.93E+01	Sample and others (1996)	Ondreicka and others (1966)	Adverse reproduction in mice	30	1.23E+00
Antimony[a]	4.70E+00	Navy (1998)	Brown and others (1976)	Decrease in water intake, kidney weight/body weight ratio, respiratory effects in Sprague-Dawley rats	110	1.01E+00
Arsenic	4.70E+00	Navy (1998)	Brown and others (1976)	Decrease in water intake, kidney weight/body weight ratio, respiratory effects in Sprague-Dawley rats	110	1.01E+00
Barium	1.98E+01	Sample and others (1996)	Borzelleca and others (1988)	Mortality in female rats	350	1.27E+01
Beryllium	6.60E+00	Sample and others (1996)	Schroeder and Mitchener (1971)	Adverse physiological effects in rats	350	4.23E+00
Cadmium	2.64E+00	Navy (1998)	Schroeder and Mitchener (1971)	Increase in young deaths and runts; failure to breed in mice	31.4	1.75E-01
Chromium	1.31E+01	Sample and others (1996)	Steven and others (1976) as cited in Eisler (1986)	Mortality in rats	350	8.42E+00
Cobalt	2.00E+01	Navy (1998)	Mollenhauer and others (1985)	Increase in testicular degeneration in rats	200	7.57E+00
Copper	6.32E+02	Navy (1998)	Hebert and others (1993)	Decreased water consumption, body weight, and increased mortality in mice	24.7	3.35E+01
Lead	2.41E+02	Navy (1998)	Wise 1981	Decrease in body weight, liver weight, and kidney weight in mice	18.7	9.82E+00
Manganese	1.59E+02	Navy (1998)	Gray and Laskey (1980)	Decrease in paired testes weight, seminal vesicle weight, and preputial gland weight in mice	29.7	1.00E+01
Mercury	4.00E+00	Navy (1998)	Wobeser and others (1976)	Adverse effects on the nervous system in rats	187.5	1.43E+00
Molybdenum	2.60E+00	Sample and others (1996)	Schroeder and Mitchener (1971)	Reduced reproductive success with a high incidence of runts in mice	30	1.65E-01
Nickel	3.16E+01	Navy (1998)	Smith and others (1993)	Increase in the number and proportion of pups born dead or dying shortly after birth during G1 in Loong-Evans rats	248.6	1.47E+01
Silver	NV	NA	NA	NA	NA	NA
Vanadium	2.10E+00	Sample and others (1996)	Domingo and others (1986)	Reproduction in rats	260	1.02E+00
Zinc	4.11E+02	Navy (1998)	Shlicker and Cox (1968)	Decreased fetus weight; fetal liver weight, and body weight in Nulliparous rats	175	1.37E+02
Pesticides						
DDT[b]	1.60E+01	Navy (1998)	EPA (1995a)	Reproductive effects in rats	320	9.42E+00

TABLE G-4: HIGH TOXICITY REFERENCE VALUES FOR THE CALIFORNIA GROUND SQUIRREL (CITELLUS BEECHEYI)

Ecological Risk Assessment For Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based high TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted high TRV (mg/kg-day)
PCBs[c]						
Total PCBs	1.28E+00	Navy (1998)	Linzey (1987)	Decrease in survival/litter; increase in birth interval, decrease number of young per litter in mice	22.85	6.31E-02
PAHs						
HMW PAHs[d]	3.28E+01	Navy (1998)	Rigdon and Neal (1969)	Increase in pulmonary adenoma	30.5	2.12E+00
LMW PAHs[e]	1.50E+02	Navy (1998)	Navarro and others (1991)	Decrease in weight gain during gestation period	270.2	7.54E+01
SVOCs						
Bis(2-ethylhexyl)phthalate	1.83E+02	Sample and others (1996)	Lamb and others (1987)	Adverse reproductive effects in mice	30	1.16E+01
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	2.40E+00	Sample and others (1996)	Schwetz and others (1978)	Significant reduction in survival and growth in rats	350	1.54E+00
VOCs						
2-Butanone	NV	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	1.00E+04	Sample and others (1996)	Lane and others (1982)	No observed effects to critical lifestages (reproduction) of mice	35	7.36E+02
Acetone	5.00E+02	Sample and others (1996)	EPA (1986)	Adverse physiological effects in rats	350	3.20E+02
Benzene	2.64E+02	Sample and others (1996)	Nawrot and Staples (1979)	Decrease in fetal weights, increase maternal mortality, and embryonic resorption	30	1.68E+01
Carbon Disulfide	NV	NA	NA	NA	NA	NA
Chloroform	4.10E+01	Sample and others (1996)	Palmer and others (1979)	Gonadal atrophy observed in male and female rats	350	2.63E+01
Ethylbenzene	NV	NA	NA	NA	NA	NA
Toluene	2.60E+02	Sample and others (1996)	Nawrot and Staples (1979)	Adverse effects on reproduction in mice	30	1.65E+01
Xylene	2.60E+00	Sample and others (1996)	Marks and others (1982)	Adverse effects on reproduction in mice	30	1.65E-01

Notes:

a Individual TRV not developed for antimony. Based on arsenic TRV.

b DDTt TRV based on 4,4'-DDT; individual TRVs not developed.

c PCB TRV based on Aroclor-1254; individual TRVs not developed.

d HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.

TABLE G-4: HIGH TOXICITY REFERENCE VALUES FOR THE CALIFORNIA GROUND SQUIRREL (CITELLUS BEECHEYI)

Ecological Risk Assessment For Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes (Continued):

*	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, acenaphthene, and 2-methylnaphthalene. TRV based on naphthalene.
a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

Navy. 1998. "Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE G-5: LOW TOXICITY REFERENCE VALUES FOR THE CALIFORNIA GROUND SQUIRREL (CITELLUS BEECHEYI)
Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted low TRV (mg/kg-day)
Metals						
Aluminum	1.93E+00	Sample and others (1996)	Ondreicka and others (1966)	Adverse reproduction in mice	30	1.23E-01
Antimony[a]	3.20E-01	Navy (1998)	Schroeder and others (1968)	Adverse effect on growth rates, survival, glycosuria, proteinuria, blood pressure, tumors, and heart weight and adverse effect on serum glucose in females (rats)	332	1.95E-01
Arsenic	3.20E-01	Navy (1998)	Schroeder and others (1968)	Adverse effect on growth rates, survival, glycosuria, proteinuria, blood pressure, tumors, and heart weight and adverse effect on serum glucose in females (rats)	332	1.95E-01
Barium	5.10E+00	Sample and others (1996)	Perry and others (1983)	Growth and hypertension in rats	435	4.01E+00
Beryllium	6.60E-01	Sample and others (1996)	Schroeder and Mitchener (1971)	Adverse physiological effects in rats	350	4.23E-01
Cadmium	6.00E-02	Navy (1998)	Webster (1988)	NOAEL for effects on fetal weight	32.2	4.08E-03
Chromium	3.28E+00	Sample and others (1996)	McKenzie and others (1958)	Physiological effects in rats	350	2.10E+00
Cobalt	1.20E+00	Navy (1998)	Domingo and others (1985)	Decrease in pup growth in rats	275	6.13E-01
Copper	2.67E+00	Navy (1998)	Pocino and others (1991)	Adverse effect on food ingestion rate, body weight, number of cells in the thymus, or mortality in mice	30	1.70E-01
Lead	1.00E+00	Navy (1998)	Agency for Toxic Substances and Disease Registry (1993)	Adverse effects on reproductive, hematological, and neurological systems in rats	208	3.93E-01
Manganese	1.37E+01	Navy (1998)	Gray and Laskey (1980)	Decrease in paired testes weight, seminal vesicle weight, and preputial gland weight in mice	34.6	9.97E-01
Mercury	2.50E-01	Navy (1998)	Wobeser and others (1976)	Adverse effects on the nervous system in rats	187.5	8.91E-02
Molybdenum	2.60E-01	Sample and others (1996)	Schroeder and Mitchener (1971)	Reduced reproductive success with a high incidence of runts in mice	30	1.65E-02
Nickel	1.33E-01	Navy (1998)	Smith and others (1993)	Increase in the number and proportion of G2 pups born dead or dying shortly after birth	248.6	6.18E-02
Silver	NV	NA	NA	NA	NA	NA
Vanadium	2.10E-01	Sample and others (1996)	Domingo and others (1986)	Reproduction in rats	260	1.02E-01

TABLE G-5: LOW TOXICITY REFERENCE VALUES FOR THE CALIFORNIA GROUND SQUIRREL (CITELLUS BEECHEYI)
Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted low TRV (mg/kg-day)
Metals (Continued)						
Zinc	9.61E+00	Navy (1998)	Aughey and others (1977)	Hypertrophy and vacuolation of pancreatic islets cells and fascicolata cells in the adrenal cortex	25.5	5.25E-01
Pesticides						
DDTt[b]	8.00E-01	Navy (1998)	EPA (1995a)	Reproductive effects in rats	320	4.71E-01
PCBs[c]						
Total PCBs	3.60E-01	Navy (1998)	Simmons and McKee (1992)	NOAEL for liver weight, drug induced sleep time, or enzyme activity in mice	20.6	1.61E-02
PAHs						
HMW PAHs[d]	1.31E+00	Navy (1998)	Neal and Rigdon (1967)	Occurrences of gastric neoplasts and change of life span in mice	30.5	8.47E-02
LMW PAHs[e]	5.00E+01	Navy (1998)	Navarro and others (1991)	Increase in maternal toxicity	276.5	2.57E+01
SVOCs						
Bis(2-ethylhexyl)phthalate	1.83E+01	Sample and others (1996)	Lamb and others (1987)	Adverse reproductive effects in mice	30	1.16E+00
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	2.40E-01	Sample and others (1996)	Schwetz and others (1978)	Significant reduction in survival and growth in rats	350	1.54E-01
VOCs						
2-Butanone	NV	NA	NA	NA	NA	NA
1,1,1,-Trichloroethane	1.00E+03	Sample and others (1996)	Lane and others (1982)	No observed effects to critiecal lifestages (reproduction) of mice	35	7.36E+01
Acetone	1.00E+02	Sample and others (1996)	EPA (1986)	Adverse physiological effects in rats	350	6.41E+01
Benzene	2.64E+01	Sample and others (1996)	Nawrot and Staples (1979)	Decrease in fetal weights, increase maternal mortality, and embryonic resorption	30	1.68E+00
Carbon Disulfide	NV	NA	NA	NA	NA	NA
Chloroform	1.50E+01	Sample and others (1996)	Palmer and others (1979)	Gonadal atrophy observed in male and female rats	350	9.61E+00
Ethylbenzene	NV	NA	NA	NA	NA	NA
Toluene	2.60E+01	Sample and others (1996)	Nawrot and Staples (1979)	Adverse effects on reproduction in mice	30	1.65E+00
Xylene	2.10E+00	Sample and others (1996)	Marks and others (1982)	Adverse effects on reproduction in mice	30	1.34E-01

Notes (Continued):

a	Individual TRV not developed for antimony. Based on arsenic TRV.
b	DDTt TRV based on 4,4'-DDT; individual TRVs not developed.
c	PCB TRV based on Aroclor-1254; individual TRVs not developed.
d	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
e	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, acenaphthene, and 2-methylnaphthalene. TRV based on naphthalene.

a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semi-volatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

<u>References:</u>

Navy. 1998. "Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.
Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE G-6: HIGH TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)

Ecological Risk Assesment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based high TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted high TRV (mg/kg-day)
Metals						
Aluminum	1.00E+03	Sample and others (1996)	Carriere and others (1986)	Adverse reproduction in the ringed dove	155	1.17E+04
Antimony[a]	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	2.93E+03
Arsenic	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	2.93E+03
Barium	4.17E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	3.64E+02
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	1.04E+01	Navy (1998)	Richardson and others (1974)	Decrease in body and testis weight, hematocrit and hemoglobin; changes in liver trace element stores; histological effects to duodenum, bone marrow, and adrenal; increase in heart weight in the Japanese quail	84	5.87E+01
Chromium	5.00E+00	Sample and others (1996)	Haaseltine and others, unpublished data	Reduction of duckling survival in black ducks	1,250	7.19E+02
Cobalt	NV	NA	NA	NA	NA	NA
Copper	5.23E+01	Navy (1998)	Jensen and Maurice (1978)	Increase in gizzard erosion and feed to gain ratio, increase in relative gizzard and proventriculus weight in Cobb broiler chicks	409	1.97E+03
Lead	8.75E+00	Navy (1998)	Edens and Garlich (1983)	Decrease egg production in adult chickens	800	7.36E+02
Manganese	7.76E+02	Navy (1998)	Laskey and Edens (1985)	Effect on serum testosterone levels in Japanese quail	196.5	1.21E+04
Mercury	1.80E-01	Navy (1998)	Heinz and Locke (1976)	Reproductive effects in mallards	1,000	1.98E+01
Molybdenum	3.53E+01	Sample and others (1996)	Cain and Pafford (1981)	Reproductive effects in chickens	1,500	6.32E+03

TABLE G-6: HIGH TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)
Ecological Risk Assesment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based high TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted high TRV (mg/kg-day)
Metals (Continued)						
Nickel	5.52E+01	Navy (1998)	Cain and Pafford (1981)	Decrease in length:weight ratio of humerus at 30 days in the mallard	580	3.16E+03
Silver	NV	NA	NA	NA	NA	NA
Vanadium	1.14E+02	Sample and others (1996)	White and Dieter (1978)	Adverse effects on mortality, body weight, and blood chemistry in mallards	1,170	1.51E+04
Zinc	1.72E+02	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallard	955	1.79E+04
Pesticides						
DDTt[c]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA 1995)	Reproductive effects in mallards	1,000	1.65E+02
PCBs[d]						
Total PCBs	1.27E+00	Navy (1998)	Britton and Huston (1973)	Decrease in hatchability in chickens	1715.4	2.67E+02
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
Bis(2-ethylhexyl)phthalate	1.10E+01	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	3.28E+00
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
2-Butanone	NV	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Chloroform	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Toluene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

TABLE G-6: HIGH TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)

Ecological Risk Assesment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes:

a	Individual TRV not developed for antimony. Based on arsenic TRV.
b	TRV of these compounds based on 4,4'-DDT; individual TRV not developed.
c	DDTt TRV based on 4,4'-DDT; individual TRVs not developed.
d	PCB TRV based on Aroclor-1254; individual TRVs not developed.
e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, acenaphthene, and 2-methylnaphthalene. TRV based on naphthalene.

a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semi-volatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

Navy. 1998. "Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE G-7: LOW TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)

Ecological Risk Assesment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted low TRV (mg/kg-day)
Metals						
Aluminum	1.10E+02	Sample and others (1996)	Carriere and others (1986)	Adverse reproduction in the ringed dove	155	1.29E+03
Antimony[a]	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	7.32E+02
Arsenic	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	7.32E+02
Barium	2.08E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	1.81E+02
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	8.00E-02	Navy (1998)	Cain and others (1983)	No observed adverse effect level for blood chemistry in mallards	798.5	6.72E+00
Chromium	1.00E+00	Sample and others (1996)	Haaseltine and others, unpublished data	Reduction of duckling survival in black ducks	1,250	1.44E+02
Cobalt	NV	NA	NA	NA	NA	NA
Copper	2.30E+00	Navy (1998)	Norvell and others (1975)	Adverse effects on weight gain in boilers	639	1.48E+02
Lead	1.40E-02	Navy (1998)	Edens and others (1976)	Decrease in female egg production and plasma calcium; decrease in male testicular and liver weight in Japanese quail	103	1.01E-01
Lead (Alternate)	3.85E+00	Sample and others (1996)	Pattee (1984)	Adverse reproductive effects in the American kestral	130	3.66E+01
Manganese	7.76E+01	Navy (1998)	Laskey and Edens (1985)	Effect on serum testosterone levels in Japanese quail	196.5	1.21E+03
Mercury	3.90E-02	Navy (1998)	Heinz (1974, 1975, 1976, and 1979)	Reproductive effects in mallards	1,000	4.29E+00
Molybdenum	3.50E+00	Sample and others (1996)	Cain and Pafford (1981)	Reproductive effects in chickens	1500	6.26E+02
Nickel	1.38E+00	Navy (1998)	Cain and Pafford (1981)	Adverse effects, such as tremors and edema, in toe and leg joints of mallards	613.75	8.45E+01

TABLE G-7: LOW TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)

Silver	NV	NA	NA	NA	NA	NA

Ecological COPC	Literature-based low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted low TRV (mg/kg-day)
Metals (Continued)						
Vanadium	1.14E+01	Sample and others (1996)	White and Dieter (1978)	Adverse effects on mortality, body weight, and blood chemistry in mallards	1,170	1.51E+03
Zinc	1.72E+01	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallards	955	1.79E+03
Pesticides						
DDTt[c]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	4.45E+00
PCBs[d]						
Total PCBs	9.00E-02	Navy (1998)	Platonow and Reinhart (1973)	Decrease in egg production in chickens	800	7.57E+00
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
Bis(2-ethylhexyl)phthalate	1.10E+00	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	3.28E-01
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
2-Butanone	NV	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Chloroform	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Toluene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

TABLE G-7: LOW TOXICITY REFERENCE VALUES FOR THE ALAMEDA SONG SPARROW (MELOSPIZA MELODIA PUSILLULA)

Ecological Risk Assesment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes:

a	Individual TRV not developed for antimony. Based on arsenic TRV.
b	TRV of these compounds based on 4,4'-DDT; individual TRV not developed.
c	DDTt TRV based on 4,4'-DDT; individual TRVs not developed.
d	PCB TRV based on Aroclor-1254; individual TRVs not developed.
e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, acenaphthene, and 2-methylnaphthalene. TRV based on naphthalene.

a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

Navy. 1998. "Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE G-8: HIGH TOXICITY REFERENCE VALUES FOR THE AMERICAN ROBIN (TURDUS MIGRATORIUS)

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based high TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted high TRV (mg/kg-day)
Metals						
Aluminum	1.00E+03	Sample and others (1996)	Carriere and others (1986)	Adverse reproduction in the ringed dove	155	2.18E+03
Antimony[a]	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	5.44E+02
Arsenic	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	5.44E+02
Barium	4.17E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	6.75E+01
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	1.04E+01	Navy (1998)	Richardson and others (1974)	Decrease in body and testis weight, hematocrit and hemoglobin; changes in liver trace element stores; histological effects to duodenum, bone marrow, and adrenal; increase in heart weight in the Japanese quail	84	1.09E+01
Chromium	5.00E+00	Sample and others (1996)	Haaseltine and others, unpublished data	Reduction of duckling survival in black ducks	1,250	1.33E+02
Cobalt	NV	NA	NA	NA	NA	NA
Copper	5.23E+01	Navy (1998)	Jensen and Maurice (1978)	Increase in gizzard erosion and feed to gain ratio, increase in relative gizzard and proventriculus weight in Cobb broiler chicks	409	3.65E+02
Lead	8.75E+00	Navy (1998)	Edens and Garlich (1983)	Decrease egg production in adult chickens	800	1.37E+02
Manganese	7.76E+02	Navy (1998)	Laskey and Edens (1985)	Effect on serum testosterone levels in Japanese quail	196.5	2.25E+03
Mercury	1.80E-01	Navy (1998)	Heinz and Locke (1976)	Reproductive effects in mallards	1,000	3.67E+00
Molybdenum	3.53E+01	Sample and others (1996)	Cain and Pafford (1981)	Reproductive effects in chickens	1,500	1.17E+03
Nickel	5.52E+01	Navy (1998)	Cain and Pafford (1981)	Decrease in length:weight ratio of humerus at 30 days in the mallard	580	5.86E+02
Silver	NV	NA	NA	NA	NA	NA

TABLE G-8: HIGH TOXICITY REFERENCE VALUES FOR THE AMERICAN ROBIN (TURDUS MIGRATORIUS)

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based high TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted high TRV (mg/kg-day)
Metals (Continued)						
Vanadium	1.14E+02	Sample and others (1996)	White and Dieter (1978)	Adverse effects on mortality, body weight, and blood chemistry in mallards	1,170	2.81E+03
Zinc	1.72E+02	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallard	955	3.32E+03
Pesticides						
DDTt[c]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA 1995)	Reproductive effects in mallards	1,000	3.06E+01
PCBs[d]						
Total PCBs	1.27E+00	Navy (1998)	Britton and Huston (1973)	Decrease in hatchability in chickens	1715.4	4.95E+01
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
Bis(2-ethylhexyl)phthalate	1.10E+01	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	2.40E+01
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
2-Butanone	NV	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Chloroform	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Toluene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

Notes:

a Individual TRV not developed for antimony. Based on arsenic TRV.

b TRV of these compounds based on 4,4'-DDT; individual TRV not developed.

c DDTt TRV based on 4,4'-DDT; individual TRVs not developed.

TABLE G-8: HIGH TOXICITY REFERENCE VALUES FOR THE AMERICAN ROBIN (TURDUS MIGRATORIUS)

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

d	PCB TRV based on Aroclor-1254; individual TRVs not developed.

Notes (Continued):

e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, acenaphthene, and 2-methylnaphthalene. TRV based on naphthalene.

a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

Navy. 1998. "Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE G-9: LOW TOXICITY REFERENCE VALUES FOR THE AMERICAN ROBIN (TURDUS MIGRATORIUS)

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted low TRV (mg/kg-day)
Metals						
Aluminum	1.10E+02	Sample and others (1996)	Carriere and others (1986)	Adverse reproduction in the ringed dove	155	2.39E+02
Antimony[a]	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	1.36E+02
Arsenic	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	1.36E+02
Barium	2.08E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	3.37E+01
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	8.00E-02	Navy (1998)	Cain and others (1983)	No observed adverse effect level for blood chemistry in mallards	798.5	1.25E+00
Chromium	1.00E+00	Sample and others (1996)	Haaseltine and others, unpublished data	Reduction of duckling survival in black ducks	1,250	2.67E+01
Cobalt	NV	NA	NA	NA	NA	NA
Copper	2.30E+00	Navy (1998)	Norvell and others (1975)	Adverse effects on weight gain in boilers	639	2.74E+01
Lead	1.40E-02	Navy (1998)	Edens and others (1976)	Decrease in female egg production and plasma calcium; decrease in male testicular and liver weight in Japanese quail	103	1.87E-02
Lead (Alternate)	3.85E+00	Sample and others (1996)	Pattee (1984)	Adverse reproductive effects in the American kestrel	130	6.79E+00
Manganese	7.76E+01	Navy (1998)	Laskey and Edens (1985)	Effect on serum testosterone levels in Japanese quail	196.5	2.25E+02
Mercury	3.90E-02	Navy (1998)	Heinz (1974, 1975, 1976, and 1979)	Reproductive effects in mallards	1,000	7.96E-01
Molybdenum	3.50E+00	Sample and others (1996)	Cain and Pafford (1981)	Reproductive effects in chickens	1500	1.16E+02
Nickel	1.38E+00	Navy (1998)	Cain and Pafford (1981)	Adverse effects, such as tremors and edema, in toe and leg joints of mallards	613.75	1.57E+01
Silver	NV	NA	NA	NA	NA	NA

TABLE G-9: LOW TOXICITY REFERENCE VALUES FOR THE AMERICAN ROBIN (TURDUS MIGRATORIUS)

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted low TRV (mg/kg-day)
Metals (Continued)						
Vanadium	1.14E+01	Sample and others (1996)	White and Dieter (1978)	Adverse effects on mortality, body weight, and blood chemistry in mallards	1,170	2.81E+02
Zinc	1.72E+01	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallards	955	3.32E+02
Pesticides						
DDTt[c]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	8.26E-01
PCBs[d]						
Total PCBs	9.00E-02	Navy (1998)	Platonow and Reinhart (1973)	Decrease in egg production in chickens	800	1.41E+00
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
Bis(2-ethylhexyl)phthalate	1.10E+00	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	2.40E+00
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
2-Butanone	NV	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Chloroform	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Toluene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

Notes:

a Individual TRV not developed for antimony. Based on arsenic TRV.

b TRV of these compounds based on 4,4'-DDT; individual TRV not developed.

c DDTt TRV based on 4,4'-DDT; individual TRVs not developed.

d	PCB TRV based on Aroclor-1254; individual TRVs not developed.

Notes (Continued):

e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, acenaphthene, and 2-methylnaphthalene. TRV based on naphthalene.

a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:

Navy. 1998. "Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE G-10: HIGH TOXICITY REFERENCE VALUES FOR THE RED-TAILED HAWK (BUTEO JAMAICENSIS)

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based high TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted high TRV (mg/kg-day)
Metals						
Aluminum	1.00E+03	Sample and others (1996)	Carriere and others (1986)	Adverse reproduction in the ringed dove	155	9.22E+01
Antimony[a]	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	2.30E+01
Arsenic	2.20E+01	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	2.30E+01
Barium	4.17E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	2.86E+00
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	1.04E+01	Navy (1998)	Richardson and others (1974)	Decrease in body and testis weight, hematocrit and hemoglobin; changes in liver trace element stores; histological effects to duodenum, bone marrow, and adrenal; increase in heart weight in the Japanese quail	84	4.61E-01
Chromium	5.00E+00	Sample and others (1996)	Haaseltine and others, unpublished data	Reduction of duckling survival in black ducks	1,250	5.64E+00
Cobalt	NV	NA	NA	NA	NA	NA
Copper	5.23E+01	Navy (1998)	Jensen and Maurice (1978)	Increase in gizzard erosion and feed to gain ratio, increase in relative gizzard and proventriculus weight in Cobb broiler chicks	409	1.54E+01
Lead	8.75E+00	Navy (1998)	Edens and Garlich (1983)	Decrease egg production in adult chickens	800	5.78E+00
Manganese	7.76E+02	Navy (1998)	Laskey and Edens (1985)	Effect on serum testosterone levels in Japanese quail	196.5	9.51E+01
Mercury	1.80E-01	Navy (1998)	Heinz and Locke (1976)	Reproductive effects in mallards	1,000	1.55E-01
Molybdenum	3.53E+01	Sample and others (1996)	Cain and Pafford (1981)	Reproductive effects in chickens	1,500	4.96E+01
Nickel	5.53E+01	Navy (1998)	Cain and Pafford (1981)	Decrease in length:weight ratio of humerus at 30 days in the mallard	580	2.48E+01
Silver	NV	NA	NA	NA	NA	NA

TABLE G-10: HIGH TOXICITY REFERENCE VALUES FOR THE RED-TAILED HAWK (BUTEO JAMAICENSIS)

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based high TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted high TRV (mg/kg-day)
Metals (Continued)						
Vanadium	1.14E+02	Sample and others (1996)	White and Dieter (1978)	Adverse effects on mortality, body weight, and blood chemistry in mallards	1,170	1.19E+02
Zinc	1.72E+02	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallard ducks	955	1.41E+02
Pesticides						
DDTt[c]	1.50E+00	Navy (1998)	Heath and others (1969), as cited in EPA 1995)	Reproductive effects in mallards	1,000	1.30E+00
PCBs[d]						
Total PCBs	1.27E+00	Navy (1998)	Britton and Huston (1973)	Decrease in hatchability in chickens	1715.4	2.10E+00
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
Bis(2-ethylhexyl)phthalate	1.10E+01	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	1.01E+00
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
2-Butanone	NV	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Chloroform	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Toluene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

Notes:

a Individual TRV not developed for antimony. Based on arsenic TRV.

b TRV of these compounds based on 4,4'-DDT; individual TRV not developed.

c DDTt TRV based on 4,4'-DDT; individual TRVs not developed.

d	PCB TRV based on Aroclor-1254; individual TRVs not developed.

Notes (Continued):

e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, acenaphthene, and 2-methylnaphthalene. TRV based on naphthalene.

a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:
Navy. 1998. "Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.
Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE G-11: LOW TOXICITY REFERENCE VALUES FOR THE RED-TAILED HAWK (BUTEO JAMAICENSIS)

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted low TRV (mg/kg-day)
Metals						
Aluminum	1.10E+02	Sample and others (1996)	Carriere and others (1986)	Adverse reproduction in the ringed dove	155	1.01E+01
Antimony[a]	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	5.75E+00
Arsenic	5.50E+00	Navy (1998)	Stanley, Jr., and others (1994)	Adverse effect on liver weight, glycogen depletion, number of days between pairing and first egg, whole-egg weight, duckling body and liver weights posthatching, duckling growth rate, and duckling production in mallards	1,172	5.75E+00
Barium	2.08E+01	Sample and others (1996)	Johnson and others (1960)	Adverse effects on mortality in 1-day-old chicks	121	1.42E+00
Beryllium	NV	NA	NA	NA	NA	NA
Cadmium	8.00E-02	Navy (1998)	Cain and others (1983)	No observed adverse effect level for blood chemistry in mallards	798.5	5.27E-02
Chromium	1.00E+00	Sample and others (1996)	Haaseltine and others, *unpublished data*	Reduction of duckling survival in black ducks	1,250	1.13E+00
Cobalt	NV	NA	NA	NA	NA	NA
Copper	2.30E+00	Navy (1998)	Norvell and others (1975)	Adverse effects on weight gain in boilers	639	1.16E+00
Lead	1.40E-02	Navy (1998)	Edens and others (1976)	Decrease in female egg production and plasma calcium; decrease in male testicular and liver weight in Japanese quail	103	7.90E-04
Lead (Alternate)	3.85E+00	Sample and others (1996)	Pattee (1984)	Adverse reproductive effects in the American kestral	130	2.87E-01
Manganese	7.76E+01	Navy (1998)	Laskey and Edens (1985)	Effect on serum testosterone levels in Japanese quail	196.5	9.51E+00
Mercury	3.90E-02	Navy (1998)	Heinz (1974, 1975, 1976, and 1979)	Reproductive effects in mallards	1,000	3.37E-02
Molybdenum	3.50E+00	Sample and others (1996)	Cain and Pafford (1981)	Reproductive effects in chickens	1,500	4.92E+00
Nickel	1.38E+00	Navy (1998)	Cain and Pafford (1981)	Adverse effects, such as tremors and edema, in toe and leg joints of mallards	613.75	6.63E-01
Silver	NV	NA	NA	NA	NA	NA

TABLE G-11: LOW TOXICITY REFERENCE VALUES FOR THE RED-TAILED HAWK (BUTEO JAMAICENSIS)

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	Literature-based low TRV (mg/kg-day)	Source of Study	Study	Endpoint	Body Weight of Study Subject (g)	Allometrically converted low TRV (mg/kg-day)
Metals (Continued)						
Vanadium	1.14E+01	Sample and others (1996)	White and Dieter (1978)	Adverse effects on mortality, body weight, and blood chemistry in mallards	1,170	1.19E+01
Zinc	1.72E+01	Navy (1998)	Gasaway and Buss (1972)	Decrease in body weight at 40 days, decrease in gonad weight, decrease in organ to body weight ratio (pancreas, adrenal, and kidney), decreases in pancreas and liver weight, leg paralysis, and diarrhea in mallards	955	1.41E+01
Pesticides						
DDTr[c]	9.00E-03	Navy (1998)	Anderson and others (1975, 1977, as cited in EPA 1995)	Reproductive effects in pelicans	3,500	3.49E-02
PCBs[d]						
Total PCBs	9.00E-02	Navy (1998)	Platonow and Reinhart (1973)	Decrease in egg production in chickens	800	5.95E-02
PAHs						
HMW PAHs[e]	NV	NA	NA	NA	NA	NA
LMW PAHs[f]	NV	NA	NA	NA	NA	NA
SVOCs						
Bis(2-ethylhexyl)phthalate	1.10E+00	Sample and others (1996)	Peakall (1974)	Adverse reproductive effects in doves	155	1.01E-01
n-Nitroso-diphenylamine	NV	NA	NA	NA	NA	NA
Pentachlorophenol	NV	NA	NA	NA	NA	NA
VOCs						
2-Butanone	NV	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NV	NA	NA	NA	NA	NA
Acetone	NV	NA	NA	NA	NA	NA
Benzene	NV	NA	NA	NA	NA	NA
Carbon disulfide	NV	NA	NA	NA	NA	NA
Chloroform	NV	NA	NA	NA	NA	NA
Ethylbenzene	NV	NA	NA	NA	NA	NA
Toluene	NV	NA	NA	NA	NA	NA
Xylene	NV	NA	NA	NA	NA	NA

Notes:

a Individual TRV not developed for antimony. Based on arsenic TRV.

b TRV of these compounds based on 4,4'-DDT; individual TRV not developed.

TABLE G-11: LOW TOXICITY REFERENCE VALUES FOR THE RED-TAILED HAWK (BUTEO JAMAICENSIS)
Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes (Continued):

c	DDTt TRV based on 4,4'-DDT; individual TRVs not developed.
d	PCB TRV based on Aroclor-1254; individual TRVs not developed.
e	HMW PAHs are defined as measured PAHs with a molecular weight greater than 200 a.u. and include: benzo(a)fluorene, fluoranthene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(b)fluorene, benzo(g,h,i)perylene, chrysene, benzo(a)anthracene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene, and benzo(a)pyrene. TRV based on benzo(a)pyrene.
f	LMW PAHs are defined as measured PAHs with a molecular weight below 200 a.u., including naphthalene, fluorene, anthracene, phenanthrene, acenaphthene, and 2-methylnaphthalene. TRV based on naphthalene.

a.u.	Atomic unit
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of concentrations of 4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
g	Gram
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
Navy	U.S. Department of Navy
NOAEL	No observed adverse effects level
NV	No value available
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
TRV	Toxicity reference value
VOC	Volatile organic chemical

References:
Navy. 1998. "Interim Final Technical Memorandum, Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California." September.
Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE G-12: ASSESSMENT AND ASSOCIATED MEASUREMENT ENDPOINTS
Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Assessment Endpoint	Associated Measurement Endpoint
Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area	Reproductive or physiological impacts to the California ground squirrel (*Citellus beecheyi*), as indicated by HQs developed based on both high (LOAEL-based) and low (NOAEL-based) TRVs
Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area	Reproductive or physiological impacts to the Alameda song sparrow (*Melospiz melodia pusillula*) and the American robin (*Turdus migratorius*), as indicated by HQs developed based on both high (LOAEL-based) and low (NOAEL-based) TRVs
Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area	Reproductive or physiological impacts to the red-tailed hawk (*Buteo jamaicensis*), as indicated by HQs developed based on both high (LOAEL-based) and low (NOAEL-based) TRVs

Notes:

HQ	Hazard quotient
LOAEL	Lowest observed adverse effects level
NOAEL	No observed adverse effects level
TRV	Toxicity reference value

TABLE G-13: PLANT AND INVERTEBRATE BIOCONCENTRATION FACTORS FOR ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN AT OU-2B SITES

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPCs	$LogK_{ow}$	$BCFs_{soil\text{-}to\text{-}invert}$ [a]	$BCFs_{soil\text{-}to\text{-}plant}$ [a]
Metals			
Aluminum	NA	0.22	0.004
Antimony	NA	0.22	0.2
Arsenic	NA	0.11	0.036
Barium	NA	0.22	0.15
Beryllium	NA	0.22	0.01
Cadmium	NA	0.96	0.364
Chromium	NA	0.01	0.0075
Cobalt	NA	0.22	0.02
Copper	NA	0.04	0.4
Lead	NA	0.03	0.045
Manganese	NA	0.22	0.25
Mercury[b]	NA	1.1398	0.051
Molybdenum	NA	0.22	0.25
Nickel	NA	0.02	0.032
Silver	NA	0.22	0.4
Vanadium	NA	0.22	0.0055
Zinc	NA	0.56	0.0000000000012
Pestides and PCBs			
DDTt	6.51	1.26	0.00937
Total PCBs[d]	6.8	1.13[d]	0.01[d]
PAHs and SVOCs			
HMW and LMW PAHs[e]	3.86	0.063	0.00991
Bis(2-ethylhexyl)phthalate	7.6	1,309	0.038
n-Nitroso-diphenylamine	3.13	26.15	0.601
Pentachlorophenol	5.12	1,034	0.0449
VOCs			
2-Butanone	0.29	0.124	26.33
1,1,1-Trichloroethane	2.49	7.82	1.41
Acetone	-0.24	0.05	52
Benzene	2.13	3.97	2.27
Carbon Disulfide	1.94	2.77	2.93
Chloroform	1.97	2.93	2.81
Ethylbenzene	3.15	27.2	0.585
Toluene	2.73	12.3	1.02
Xylene	3.2	29.84	0.548

Notes:

a Based on values presented in EPA 1999, or regression equations published in EPA 1999.
b Based on BCF for total mercury, which assumed 87 percent consisting of divalent mercury and 13 percent consisting of methylmercury (EPA 1999).
c Based on BCF for parent compound, Heptachlor (EPA 1999).
d Based on BCF for Aroclor-1254 (EPA 1999).
e Based on the average of the BCFs presented for PAHs presented in EPA 1999.

BCF Bioconcentration factor
$BCF_{soil\text{-}to\text{-}inverts}$ Bioconcentration factor for uptake of constituent from soil to invertebrate tissue
$BCF_{soil\text{-}to\text{-}plant}$ Bioconcentration factor for uptake of constituent from soil to plant tissue
COPC Chemical of potential concern

TABLE G-13: BIOACCUMULATION FACTORS FOR ECOLOGICAL CHEMICALS OF POTENTITAL CONCERN AT OU-2A SITES
Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes (Continued)

DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of the concentrations of 4,4'- Dichlorodiphenyldichloroethane, 4,4'- Dichlorodiphenyldichloroethene, and 4,4'- Dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
HMW	High molecular weight
LMW	Low molecular weight
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semivolatile organic chemical
VOC	Volatile organic chemical

<u>Reference:</u>

EPA. 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Solid Waste and Emergency Response. EPA530-D-99-001A. August.

TABLE G-14: CALCULATED MAMMAL BIOCONCENTRATION FACTORS FOR ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN AT OU-2B SITES

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda

Ecological COPC	Log K_{ow}	Ba_{mammal}[a] (day/kg)	$BCF_{soil\text{-}to\text{-}mammal}$[b] (unitless)	$BCF_{plant\text{-}to\text{-}mammal}$[b] (unitless)
Metals				
Aluminum[b]	NA	1.00E+00	1.99E-03	7.88E-02
Antimony[c]	NA	1.00E-03	1.99E-06	7.88E-05
Arsenic	NA	2.00E-03	3.98E-06	1.58E-04
Barium[c]	NA	1.50E-04	2.99E-07	1.18E-05
Beryllium[c]	NA	1.00E-03	1.99E-06	7.88E-05
Cadmium[c]	NA	6.50E-06	1.29E-08	5.12E-07
Chromium[c]	NA	5.50E-03	1.09E-05	4.33E-04
Cobalt[b]	NA	1.00E+00	1.99E-03	7.88E-02
Copper[c]	NA	1.00E-02	1.99E-05	7.88E-04
Lead[c]	NA	3.00E-04	5.97E-07	2.36E-05
Manganese[b]	NA	1.00E+00	1.99E-03	7.88E-02
Mercury	NA	1.40E-02[c]	2.79E-05	1.10E-03
Molybdenum[b]	NA	1.00E+00	1.99E-03	7.88E-02
Nickel[c]	NA	6.00E-03	1.19E-05	4.73E-04
Silver[c]	NA	3.00E-03	5.97E-06	2.36E-04
Vanadium[b]	NA	1.00E+00	1.99E-03	7.88E-02
Zinc[c]	NA	9.00E-05	1.79E-07	7.09E-06
Pesticides and PCBs[d]				
DDTt[e]	6.51	2.04E-01	4.06E-04	1.61E-02
Total PCBs	6.8	1.59E-01	3.16E-04	1.25E-02
SVOCs[d]				
HMW and LMW PAHs[h]	Varies	3.07E-02	6.11E-05	2.42E-03
Bis(2-ethylhexyl)phthalate	7.6	4.00E-03	7.96E-06	3.15E-04
n-Nitroso-diphenylamine	3.13	3.39E-05	6.75E-08	2.67E-06
Pentachlorophenol	5.12	3.31E-03	6.59E-06	2.61E-04
VOCs[d]				
2-Butanone	0.29	4.90E-08	9.75E-11	3.86E-09
1,1,1-Trichloroethane	2.49	7.76E-06	1.54E-08	6.11E-07
Acetone	-0.24	1.45E-08	2.89E-11	1.14E-09
Benzene	2.13	3.39E-06	6.75E-09	2.67E-07
Carbon Disulfide	1.94	2.19E-06	4.36E-09	1.73E-07
Chloroform	1.97	2.34E-06	4.66E-09	1.84E-07
Ethylbenzene	3.15	3.55E-05	7.06E-08	2.80E-06
Toluene	2.73	1.35E-05	2.69E-08	1.06E-06
Xylene	3.2	3.98E-05	7.92E-08	3.14E-06

Notes:

a For metals, the Ba_{mammal} value was presented in EPA 1998, unless noted otherwise. For organics, Ba_{mammal} values were calculated using the correlation equation derived by Travis and Arms (1984).

b Calculated by multiplying the Ba_{mammal} by the soil and plant ingestion rate for the California ground squirrel of 0.00199 kg/day-DW and 0.07879 kg/day-FW, respectively (EPA 1999).

TABLE G-14: CALCULATED MAMMAL BIOCONCENTRATION FACTORS FOR ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN AT OU-2B SITES

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda

Notes (Continued):

c	Default Ba_{mammal} value of 0.02 kg/day-DW for total mercury presented in EPA 1997, was used and converted to FW by assuming 70 percent moisture in mammals (EPA 1999).
e	Based on log K_{ow} for 4,4-Dichlorodiphenyltrichloroethane

Ba_{mammal}	Biotransfer factor for mammals
$BCF_{plant-to-mammal}$	Bioconcentration factor from plant food item to mammals
$BCF_{soil-to-mammal}$	Bioconcentration factor from incidental soil ingestion to mammals
COPC	Chemical of potential concern
day/kg	Day per kilogram
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of the concentrations of 4,4'- Dichlorodiphenyldichloroethane, 4,4'- Dichlorodiphenyldichloroethene, and 4,4'- Dichlorodiphenyltrichloroethane
DW	Dry weight
EPA	U.S. Environmental Protection Agency
FW	Fresh weight
HMW	High molecular weight
kg/day	Kilogram per day
Log K_{ow}	Octanol-water partition coefficient (unitless)
LMW	Low molecular weight
NA	Not applicable
ORD	Office of Research and Development
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semi-volatile organic chemical
VOC	Volatile organic chemical

References:

EPA. 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Solid Waste and Emergency Response. EPA530-D-99-001A. August.

EPA. 1998. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Solid Waste and Emergency Response. EPA530-D-98-001A. July.

EPA. 1997. Mercury Study Report to Congress, Volumes I through VIII. Office of Air Quality Planning and Standards and ORD. EPA/452/R-97-001. December.

Travis, C.C. and A.D. Arms. 1988. "Bioconcentration of Organics in Beef, Milk, and Vegetation." Environmental Science and Technology. Volume 22. Pages 271-274.

TABLE G-15: FOOD-CHAIN MULTIPLIERS BY TROPHIC LEVEL FOR ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN AT OU-2B SITES

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	LOG K_{ow}	Food-Chain Multiplier[a]		
		Trophic Level of Consumer		
		2	3	4
Metals[b]				
Aluminum	NA	1	1	1
Antimony	NA	1	1	1
Arsenic	NA	1	1	1
Barium	NA	1	1	1
Beryllium	NA	1	1	1
Cadmium	NA	1	1	1
Chromium	NA	1	1	1
Cobalt	NA	1	1	1
Copper	NA	1	1	1
Lead	NA	1	1	1
Manganese	NA	1	1	1
Mercury	NA	1	1	1
Molybdenum	NA	1	1	1
Nickel	NA	1	1	1
Silver	NA	1	1	1
Vanadium	NA	1	1	1
Zinc	NA	1	1	1
Pesticides and PCBs				
DDTt	6.91	1	14	27
Total PCBs	6.8	1	14	27
SVOCs				
HMW and LMW PAHs[a]	5.6	1	7.1	8.6
Bis(2-ethylhexyl)phthalate	7.6	1	12	17
n-Nitroso-diphenylamine	3.13	1	1	1
Pentachlorophenol	5.12	1	3.6	3.2
VOCs				
2-Butanone	0.29	1	1	1
1,1,1-Trichloroethane	2.49	1	1	1
Acetone	-0.24	1	1	1
Benzene	2.13	1	1	1
Carbon Disulfide	1.94	1	1	1
Chloroform	1.97	1	1	1
Ethylbenzene	3.15	1	1	1
Toluene	2.73	1	1	1
Xylene	3.2	1	1	1

Notes:

a	Obtained from EPA 1999
b	FCMs were not presented for metals, assumed a ratio of 1.
COPC	Chemical of potential concern
DDT	Dichlorodiphenyltrichloroethane
DDTt	Sum of the concentrations of 4,4'- Dichlorodiphenyldichloroethane, 4,4'- Dichlorodiphenyldichloroethene, and 4,4'- Dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
FCM	Food-chain multiplier

TABLE G-15: FOOD-CHAIN MULTIPLIERS BY TROPHIC LEVEL FOR ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN AT OU-2B SITES

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes (Continued):

HMW	High molecular weight
K_{ow}	Octanol-water partition coefficient (unitless)
LMW	Low molecular weight
LOG	Logarithm
NA	Not applicable
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
SVOC	Semi-volatile organic chemical
VOC	Volatile organic chemical

References:

EPA. 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Solid Waste and Emergency Response. EPA530-D-99-001A. August

TABLE G-16: VALUES FOR EXPOSURE FACTORS FOR MEASUREMENT ENDPOINT RECEPTORS

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Exposure Parameters	Abbreviation	Units	California ground squirrel	Alameda song sparrow	American Robin	Red-tailed hawk
Daily Food Ingestion Rate[a]	Total Food IR	kg/day-FW	0.0984	0.01498	0.03511	0.327
		kg/day-DW	0.03161	0.00486	0.01267	0.0898
Incidental Soil Ingestion Rate[b]	Soil IR	kg/day-DW	0.00199	0.000457	0.0012	0.00063
Plant Percentage of Diet[c]	Plant Percent	percent	80%	50%	50%	--
Plant Ingestion Rate[c]	Plant IR	kg/day-FW	0.07879	0.00749	0.0176	--
Invertebrate Percentage of Diet[d]	Invertebrate Percent	percent	20%	50%	50%	--
Invertebrate Ingestion Rate[d]	Invert IR	kg/day-FW	0.0197	0.00749	0.0176	--
Vertebrate Percentage of Diet[e]	Vertebrate Percent	percent	--	--	--	100%
Vertebrate Ingestion Rate[e]	Vert IR	kg/day-FW	--	--	--	0.327
Site Use Factor[f]	SUF	unitless	1.00	1.00	1.00	1.00
Body Weight[g]	BW	kg	0.562	0.0199	0.081	1.13

Notes:

a Based on the formula presented in Nagy 2001. Dry and Fresh weight both calculated since wildlife tissues assessed on a FW basis and soil is assessed on a DW basis.

b For California ground squirrel, based on estimated percent soil in diet of jack rabbits, 6.3%, multiplied by the total IR (Arthur and Gates [1988] as cited in EPA 1993); for Alameda song sparrow, based on sediment consumption by wild turkey (9.4 percent of total IR) (Beyer and others 1994); and for red-tailed hawk, based on estimated percent soil in diet of bald eagles, 0.7% (Beyer and others 1994), multiplied by the total Food IR for dry matter intake (Nagy 2001).

c For California ground squirrel, plant IR based on 80% of net food IR (California EPA, 2000); for Alameda song sparrow and American robin, plant IR based on 50% of net food IR (EPA 1993).

d For California ground squirrel, invertebrate IR based on 20% of net food IR (California EPA, 2000); for Alameda song sparrow and American robin, invertebrate IR based on 50% of net food IR (EPA 1993).

e Vertebrate IRs for the red-tailed hawk calculated based upon 100% of the net food IR.

f Site use factor based upon the conservative estimate of 100% use of all receptors at all times.

g For the California ground squirrel, based on the average female body weight (Holecamp and Nunes 1989); for the Alameda song sparrow, based upon the mean value for male and female adults during nesting, post-nesting, and winter (Dunning 1993); for the American robin based on the average body weight of an adult robin; for the red-tailed hawk based on the average body weight of an adult red-tailed hawk.

TABLE G-16: VALUES FOR EXPOSURE FACTORS FOR MEASUREMENT ENDPOINT RECEPTORS

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes (Continued):

–	This exposure parameter is not applicable to this receptor.
BW	Body weight
FW	Fresh weight
DW	Dry weight
IR	Ingestion rate
kg	Kilogram
kg/day	Kilogram per day
SUF	Site use factor

References:

Beyer, W.N., G.H. Heinz, and A.W. Redmon-Norwood. 1996. *Environmental Contaminants in Wildlife: Interpreting Tissue Concentrations. CRC Press Inc.* Boca Raton, Florida.

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TABLE G-17: OU-2B SITES 3, 11, AND 21 (THE PINK) SOIL BACKGROUND STATISTICS

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Chemical	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	Mean Concentration (mg/kg)	UCL95[a] (mg/kg)
Metals						
Aluminum[b]	55/55	1,760	22,600	5,230	5,799.87	6,521.2
Antimony[c]	18/55	0.7	8.6	2.6	2.77	3.82
Arsenic[d]	45/55	0.44	15.6	1.7	2.58	4.21
Barium[b]	55/55	6.91	156	32.5	41.33	47.55
Beryllium[e]	28/55	0.25	1.47	0.58	0.5	0.61
Cadmium[c]	11/55	0.1	3.19	0.33	0.36	0.71
Calcium[d]	55/55	816	66,600	2,400	3,805.34	4,704.82
Chromium[b]	55/55	15.6	66.7	29.2	30.31	32.56
Cobalt[d]	48/55	3.02	49.7	4.7	5.68	6.58
Copper[d]	52/55	3.12	49.1	6.91	8.95	10.51
Iron[d]	55/55	4,500	27,900	8,590	10,108.88	11,154.7
Lead[d]	51/55	0.47	165	3.2	7.05	9.98
Magnesium[d]	55/55	1,290	8,800	2,320	2,859.91	3,175.36
Manganese[d]	55/55	55.50	748	108	145.19	167.2
Mercury[c]	7/54	0.06	2.71	0.1	0.11	0.36
Molybdenum[c]	0/16	NA	NA	3.1	NA	NA
Nickel[d]	55/55	11.5	80.4	24.3	27.22	29.53
Potassium[b]	55/55	209	2,480	691	740.63	820.09
Selenium[c]	0/55	NA	NA	0.42	NA	NA
Silver[c]	11/55	0.32	5.64	0.54	0.53	1.12
Sodium[b]	54/55	62.6	1,580	325	411.81	495.34
Thallium[c]	0/55	NA	NA	0.3	NA	NA
Titanium[c]	1/1	518	518	518	NA	NA
Vanadium[d]	55/55	10.5	55.3	21.0	22.52	24.5
Zinc[d]	54/55	9.98	191	20.6	25.66	29.27

Notes:

a The UCL95 may be less than the minimum detected concentration or exceed the maximum detected concentration, because one-half of the quantitation limit was used as a proxy value for non-detected results. The UCL95 was calculated using a distribution-dependent formula.

b Distribution determined to be lognormal.

c Distribution not tested.

d Distribution assumed to be lognormal based on examination of probability plots and outlier box plots.

e Distribution assumed to be normal based on examination of probability plots and outlier box plots.

mg/kg Milligram per kilogram

NC Not calculated, detection of frequency lower than 50 percent

UCL95 95th percentile upper confidence limit on the arithmetic mean

TABLE G-18: OU-2B SITE 4 (THE BLUE) SOIL BACKGROUND STATISTICS

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Chemical	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	Mean Concentration (mg/kg)	UCL95[a] (mg/kg)
Metals						
Aluminum[b]	88/88	2,880	26,800	4,965	6,417.49	7,073.7
Antimony[c]	2/88	0.89	1	2.4	2.16	2.9
Arsenic[c]	33/88	0.74	23	2.9	4.59	6.39
Barium[b]	85/88	0.3	198	38.75	53.01	63.26
Beryllium[c]	25/88	0.09	0.77	0.3	0.37	0.49
Cadmium[c]	29/88	0.1	0.82	0.3	0.4	0.49
Calcium[b]	88/88	1,360	19,200	2,600	3,683.74	4,201.93
Chromium[b]	66/88	11.4	81.7	29.5	33.5	35.74
Cobalt[d]	66/88	1.9	14	5.35	5.37	6.45
Copper[b]	83/88	4.2	89.4	9.7	13.12	15.23
Iron[b]	88/88	760	26,900	8,140	10,072.09	11,092.99
Lead[c]	27/88	1.3	41	5.9	5.31	7.54
Magnesium[b]	88/88	1,510	42,400	2,240	2,867.67	3,156.01
Manganese[b]	88/88	50	1,060	108.5	143.63	159.52
Mercury[c]	0/22	NC	NC	0.17	NC	NC
Molybdenum[c]	0/85	NC	NC	1.4	NC	NC
Nickel[b]	88/88	11.6	88.5	24	29.17	31.64
Potassium[b]	87/88	310	6,382	770	902.98	996.73
Selenium[c]	1/88	5.7	5.7	5	4.05	4.67
Silver[c]	2/88	0.44	0.61	0.7	1.07	1.88
Sodium[b]	68/88	88.1	3,510	340	422.62	718.2
Thallium[c]	1/88	5.3	5.3	3.1	3.2	4.16
Titanium[d]	66/66	223	1,020	372.5	407.1	436.76
Vanadium[b]	88/88	12.8	62.3	20	22.23	23.68
Zinc[b]	88/88	14	84	24.85	28.55	30.93

Notes:

a The UCL95 may be less than the minimum detected concentration or exceed the maximum detected concentration, because one-half of the quantitation limit was used as a proxy value for non-detected results. The UCL95 was calculated using a distribution-dependent formula.

b Distribution assumed to be lognormal based on examination of probability plots and outlier box plots.

c Distribution not tested.

d Distribution determined to be lognormal.

mg/kg Milligram per kilogram

NC Not calculated, detection of frequency lower than 50 percent

UCL95 95th percentile upper confidence limit on the arithmetic mean

TABLE G-19: OU-2B GROUNDWATER BACKGROUND STATISTICS

Ecological Risk Assessment for Sites 6, 7, 8, and 16, Alameda Point, Alameda, California

Chemical	SCREENING LEVELS MARINE[a]		Frequency of Detection	Minimum Concentration	Maximum Concentration	Median Concentration	Mean Concentration	UCL95
	CCC	CMC[b]						
Metals (mg/L)								
Aluminum[c]	**	**	56/194	0.003	4.53	0.0408	0.1931	0.4018
Antimony[c]	0.5[d]	NA	13/194	0.0019	0.0478	0.0065	0.0083	0.0123
Arsenic[e]	0.036	NA	107/198	0.0014	0.0407	0.0053	0.0081	0.0158
Barium[f]	**	**	161/194	0.0023	1.26	0.0425	0.1347	0.3298
Beryllium[c]	**	**	18/194	0.0009	0.003	0.001	0.0007	0.0009
Cadmium[c]	0.0093	NA	22/194	0.0002	0.0034	0.0006	0.0009	0.0013
Calcium[f]	**	**	194/198	0.62	513	21.3	57.3059	76.7281
Chromium[c]	0.05[g]	NA	33/194	0.0006	0.0828	0.0023	0.0031	0.0056
Cobalt[c]	**	**	12/194	0.0008	0.0105	0.0061	0.0039	0.0055
Copper[c]	0.0031	NA	60/194	0.0018	0.0273	0.0059	0.006	0.0087
Iron[f]	**	**	130/198	0.0072	24.4	0.1305	2.0403	9.3908
Lead[c]	0.0081	NA	17/195	0.0012	0.0284	0.0013	0.0013	0.0024
Magnesium[f]	**	**	198/198	0.549	1,070	15.15	67.9087	98.1515
Manganese[f]	**	**	187/198	0.0011	2.48	0.1315	0.8066	1.3736
Mercury[c]	0.00094[d,h]	NA	4/198	0.0002	0.0006	0.0002	0.0001	0.0001
Molybdenum[c]	**	**	12/119	0.0005	0.0194	0.0096	0.0045	0.0064
Nickel[c]	0.0082	NA	23/198	0.0007	0.151	0.0113	0.0076	0.0127
Potassium[e]	**	**	193/198	1.2	505	15	33.4114	41.749
Selenium[c]	0.071	NA	1/193	0.0025	0.0025	0.0024	0.0015	0.0029
Silver[c]	NV	0.00019	4/188	0.0002	0.0048	0.002	0.0014	0.0019
Sodium[f]	**	**	198/198	4.6	8,160	140.5	660.4794	907.9395
Thallium[c]	0.04	NA	3/193	0.0036	0.0052	0.0027	0.0021	0.0041
Vanadium[c]	**	**	72/198	0.002	0.0508	0.007	0.0073	0.0103
Zinc[c]	0.081	NA	65/198	0.0028	46.8	0.0078	0.247	1.2774

Notes:

a Based on the California Toxics Rule Criteria (EPA) for Enclosed Bays and Estuaries, Saltwater Aquatic Life Protection, unless otherwise specified. See full reference below.

b When the chronic criteria, the CCC, was not available, the published acute criteria, the CMC, divided by an uncertainty factor of 10 was used. The CMC was divided by 10 to estimate chronic effects.

TABLE G-19: OU-2B GROUNDWATER BACKGROUND STATISTICS

Ecological Risk Assessment for Sites 6, 7, 8, and 16, Alameda Point, Alameda, California

Notes (Continued)

c	Distribution was not tested if sample size was less than five or frequency of detection was less than 50 percent. Lognormal distribution was assumed.
d	California Toxics Rule Criteria not available; therefore, value from US EPA National AWQC, Saltwater Aquatic Life Protection as presented in the NOAA SQuiRT Tables. See full reference below.
e	Distribution determined to be lognormal, based on Shapiro-Wilk W test (alpha = 0.05).
f	Distribution unknown. Assumed to be lognormal based on examination of probability plots, box-plots, and frequency histograms.
g	Based on Chromium 6+
h	Based on Inorganic Mercury

AWQC	Ambient water quality criteria
CCC	Criteria continuous concentration
CDL	Concentration not above 1/10 the diluted concentration
CMC	Criteria maximum concentration
CSB	Concentration within statistical background
CSL	Concentration within screening level concentration
EN	Essential nutrient
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
FOD	Frequency of detection less than 5 percent
mg/L	Microgram per Liter
NA	Not applicable, CCC value available
NB	Non-bioaccumulating
NOAA	National Oceanic and Atmospheric Administration
NV	No value available
SQuiRT	Screening Quick Reference Tables
UCL95	95th percentile upper confidence limit on the arithmetic mean

** California Toxic Rule Criteria or US EPA AWQC not available

<u>References</u>:

California Environmental Protection Agency, Regional Water Quality Control Board Central Valley Region. 2000. A Compilation of Water Quality Goals. August.
NOAA. 1999. NOAA SQuiRTs. Hazmat Report 99-1. Updated September.

TABLE G-20: SITE 3, 11, AND 21 - (THE PINK) BACKGROUND SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	MEASUREMENT ENDPOINTS							
	Reproductive or physiological impacts to the California ground squirrel		Reproductive or physiological impacts to the Alameda song sparrow		Reproductive or physiological impacts to the American robin		Reproductive or physiological impacts to the Red-tailed hawk	
	HAZARD QUOTIENT							
	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV
Aluminum	6.00E+01[a]	6.00E+02[a]	5.91E-02[a]	5.36E-01[a]	1.87E-01[a]	1.71E+00[a]	9.81E-01[a]	8.96E+00[a]
Antimony	5.53E-02[b]	2.86E-01[b]	1.50E-04[a]	5.99E-04[a]	4.75E-04[a]	1.90E-03[a]	2.21E-03[a]	8.83E-03[a]
Arsenic	3.34E-02[b]	1.73E-01[b]	9.48E-05[a]	3.80E-04[a]	3.06E-04[a]	1.23E-03[a]	1.27E-03[a]	5.07E-03[a]
Barium	5.16E-02[b]	1.63E-01[b]	1.47E-02[a]	2.96E-02[a]	4.68E-02[a]	9.37E-02[a]	2.21E-01[a]	4.45E-01[a]
Beryllium	1.65E-03[b]	1.65E-02[b]	NV	NV	NV	NV	NV	NV
Cadmium	1.76E-01[a]	7.54E+00[a]	4.85E-03[a]	4.23E-02[b]	1.51E-02[a]	1.32E-01[b]	8.64E-02[a]	7.56E-01[b]
Chromium	1.55E-02[b]	6.23E-02[b]	1.23E-03[b]	6.12E-03[b]	4.21E-03[b]	2.09E-02[b]	6.58E-03[b]	3.28E-02[b]
Cobalt	1.01E-02[a]	1.24E-01[a]	NV	NV	NV	NV	NV	NV
Copper	3.66E-03[b]	7.22E-01[b]	2.99E-04[b]	3.98E-03[b]	9.76E-04[b]	1.30E-02[b]	1.97E-03[b]	2.62E-02[b]
Lead	5.44E-03[b]	1.36E-01[a]	4.92E-04[a]	3.59E+00[a]	1.64E-03[a]	1.20E+01[a]	3.96E-03[a]	2.90E+01[a]
Lead, alternate TRV[c]	NA	NA	NA	9.90E-03[a]	NA	3.31E-02[a]	NA	7.98E-02[a]
Manganese	2.58E-01[a]	2.59E+00[a]	1.62E-03[a]	1.62E-02[a]	5.13E-03[a]	5.13E-02[a]	2.53E-02[a]	2.53E-01[a]
Mercury	1.12E-02[b]	1.79E-01[b]	8.25E-03[a]	3.81E-02[a]	2.58E-02[a]	1.19E-01[a]	1.54E-01[a]	7.10E-01[a]
Molybdenum	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	9.60E-03[a]	2.28E+00[a]	2.98E-04[b]	1.12E-02[b]	1.01E-03[b]	3.76E-02[b]	2.05E-03[b]	7.66E-02[b]
Silver	NV	NV	NV	NV	NV	NV	NV	NV
Vanadium	2.73E-01[a]	2.73E+00[a]	1.72E-04[b]	1.72E-03[b]	5.46E-04[b]	5.46E-03[b]	2.86E-03[b]	2.86E-02[b]
Zinc	4.95E-03[a]	1.29E+00[b]	3.82E-04[b]	3.82E-03[b]	1.20E-03[b]	1.20E-02[b]	6.84E-03[b]	6.84E-02[b]

Notes:

a TRV based on an reproductive effect

b TRV based on an physiological effect

c The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes an alternate, less conservative, low TRV of 3.85 mg/kg-day as referenced in Sample and Others (1996) was used.

TABLE G-20: SITE 3, 11, AND 21 - (THE PINK) BACKGROUND SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes (Continued)

mg/kg-day	Milligram per kilogram per day
NA	Not applicable
COPC	Chemical of potential concern
ND	Not detected in background samples
NV	Reference value not available, HQ could not be calculated
TRV	Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE G-21: OU-2B SITE 4 - (THE BLUE) BACKGROUND SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	MEASUREMENT ENDPOINTS							
	Reproductive or physiological impacts to the California ground squirrel		Reproductive or physiological impacts to the Alameda song sparrow		Reproductive or physiological impacts to the American robin		Reproductive or physiological impacts to the Red-tailed hawk	
	HAZARD QUOTIENT							
	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV
Aluminum	6.51E+01[a]	6.51E+02[a]	6.41E-02[a]	5.81E-01[a]	2.03E-01[a]	1.85E+00[a]	1.06E+00[a]	9.72E+00[a]
Antimony	4.20E-02[b]	2.17E-01[b]	1.14E-04[a]	4.55E-04[a]	3.61E-04[a]	1.44E-03[a]	1.68E-03[a]	6.70E-03[a]
Arsenic	5.06E-02[b]	2.62E-01[b]	1.44E-04[a]	5.76E-04[a]	4.65E-04[a]	1.86E-03[a]	1.92E-03[a]	7.70E-03[a]
Barium	6.86E-02[b]	2.17E-01[b]	1.96E-02[a]	3.93E-02[a]	6.22E-02[a]	1.25E-01[a]	2.94E-01[a]	5.92E-01[a]
Beryllium	1.32E-03[b]	1.32E-02[b]	NV	NV	NV	NV	NV	NV
Cadmium	1.21E-01[a]	5.20E+00[a]	3.35E-03[a]	2.92E-02[a]	1.04E-02[a]	9.11E-02[a]	5.96E-02[a]	5.22E-01[a]
Chromium	1.71E-02[b]	6.84E-02[b]	1.35E-03[b]	6.72E-03[b]	4.62E-03[b]	2.30E-02[b]	7.22E-03[b]	3.60E-02[b]
Cobalt	9.87E-03[a]	1.22E-01[a]	NV	NV	NV	NV	NV	NV
Copper	5.31E-03[b]	1.05E+00[b]	4.34E-04[b]	5.77E-03[b]	1.41E-03[b]	1.88E-02[b]	2.86E-03[b]	3.79E-02[b]
Lead	4.11E-03[b]	1.03E-01[a]	3.72E-04[a]	2.71E+00[a]	1.24E-03[a]	9.07E+00[a]	2.99E-03[a]	2.19E+01[a]
Lead, alternate TRV[c]	NA	NA	NA	7.48E-03[a]	NA	2.50E-02[a]	NA	6.03E-02[a]
Manganese	2.47E-01[a]	2.47E+00[a]	1.54E-03[a]	1.54E-02[a]	4.89E-03[a]	4.89E-02[a]	2.42E-02[a]	2.42E-01[a]
Mercury	ND	ND	ND	ND	ND	ND	ND	ND
Molybdenum	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	1.03E-02[a]	2.45E+00[a]	3.20E-04[b]	1.20E-02[b]	1.08E-03	4.03E-02	2.19E-03	8.20E-02
Silver	NV	NV	NV	NV	NV	NV	NV	NV
Vanadium	2.63E-01[a]	2.63E+00[a]	1.66E-04	1.66E-03	5.28E-04	5.28E-03	2.76E-03	2.76E-02
Zinc	5.23E-03[a]	1.37E+00[a]	4.04E-04	4.04E-03	1.27E-03	1.27E-02	7.23E-03	7.23E-02

Notes:

a TRV based on an reproductive effect

b TRV based on an physiological effect

c The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes an alternate, less conservative, low TRV of 3.85 mg/kg-day as referenced in Sample and Others (1996) was used.

mg/kg-day Milligram per kilogram per day

TABLE G-21: OU-2B SITE 4 - (THE BLUE) BACKGROUND SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT
Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes (Continued):

COPC	Chemical of potential concern
NA	Not applicable
ND	Not detected in background samples
NV	Reference value not available, HQ could not be calculated
TRV	Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

G.2 SITE-SPECIFIC SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENTS

This section describes the results of the modified ERA for Sites 3, 4, 11, and 21, including site-specific considerations, factors, and uncertainties in the assessment. These sites are very similar in environmental setting and the ERA conducted for each used the same parameters. The following sections describe the ERA process for the sites.

G.2.1 PROBLEM FORMULATION

The problem formulation process was discussed previously in Section G.1.2.2. The following sections relate site-specific information of this process for each of the OU-2B sites.

G.2.1.1 Environmental Setting and Contaminants

The environmental setting for each of the OU-2B sites and the groundwater is described in the following text.

Site 3

Site 3 is located at the eastern entrance of Alameda Point along West Atlantic Avenue and West Seaplane Lagoon Street, and is bordered to the south by Site 4 (see Figure G-1). The site is approximately 50 acres in size, roughly rectangular in shape, and comprises Parcels 116A, 116B, 116C, 117, 118A, 118B, 120, 122, 128, 129A, 129B, 131, and 209. Site 3 currently is considered a developed area and is bordered by developed or airfield/paved areas (Naval Facilities Engineering Command, Engineering Field Activity West [EFA WEST]) (see Figure G-4).

Site 3 also is known as the Abandoned Fuel Storage Area. Five underground storage tanks (UST) containing aviation gasoline (AVGAS) are known to have been placed at Site 3. Three of the five fuel USTs were cleaned and closed in place in 1975 after leaks were detected in one of the tanks. The other two tanks were closed in place but were not cleaned before closure. Alameda Point personnel estimated that as much as 365,000 gallons of AVGAS may have leaked into the surrounding soil and groundwater in the 1960s and early 1970s. In addition, a nearby fuel line burst in 1972 releasing an unknown amount of AVGAS into the surrounding soil. (Kennedy Engineers 1979) AVGAS has been found in utility ducts, storm drains and soil samples in and around Site 3. Site 3 also has been designated as Corrective Action Area (CAA)-3. See Section 5.0 of the RI for more information concerning the features of Site 3.

Approximately 80 percent of Site 3 is open space consisting of lawn and landscaped areas, roadways, general vehicle parking lots, container storage areas, gardening supply storage areas, and vehicle parking specifically associated with a retail store, credit union, and resturant. Most parking and roadway areas are paved with concrete aprons adjacent to some buildings. The paved parking areas show the typical vehicle stains associated with a parking space. In 1947, some of the northern portions of Site 3 were used as a storage area before being developed

(Environmental Resources Management-West, Inc. [ERM-West] 1994). Typical urban wildlife, such as the California ground squirrel, scrub jays, and American robins, may be observed in the developed areas but to a lesser extent than in the landscaped areas because less foraging habitat is available. Feral cats also are found in the developed areas of Site 3 (EFA WEST 1999).

Site 4

Site 4 is located in the eastern portion of Alameda Point. The site is located south of West Atlantic Avenue and north of OU-2A (see Figure G-1). It is approximately 14 acres in size, rectangular in shape, and comprises Parcels 133, 143, and 144 and sub-parcels 134A and 164A. Site 4 currently is considered a developed area and is bordered by developed areas (EFA WEST 1999) (see Figure G-4).

Site 4 is known as Building 360 and also as the aircaft engine facility because it was constructed in 1953 to operate as an aircraft engine and air frame overhaul facility. Operations ceased in April 1997 (International Technology Corporation [IT] 2001). Site 4 also includes portions of areas designated as CAA-3C, CAA-4A, CAA-4B, CAA-4C, and CAA-13 because of the presence of petroleum contamination in groundwater at these locations. Three USTs, five oilwater separators (OWS), underground fuel lines, and three Resource Conservation and Recovery Act (RCRA) sites are physical features of concern at the site. See Section 6.0 of the RI for more information concerning the features of Site 4.

Approximately 65 percent of Site 4 consists of open space that historically was used for fuel storage in both USTs and aboveground storage tanks (AST), hazardous materials storage lockers, motor gasoline (MOGAS) refueling, miscellaneous parts and equipment storage, aircraft engine storage (in the northeast portion), trash disposal dumpsters, and chemical storage on the south side of Building 163, drum storage, and parking (ERM-West 1994). Currently these open areas are paved vehicle parking, storage areas, and a large landscaped sports field, which is located along the eastern border. Typical urban wildlife, such as the California ground squirrel, scrub jays, and American robins, may be observed in the developed areas but to a lesser extent than in the landscaped areas, because less foraging habitat is available. Feral cats also are found in the developed areas of Site 4 (EFA WEST 1999).

Site 11

Site 11 is located in the eastern portion of Alameda Point. The site is located south of Ingersol Street, west of Viking Street, north of CAA-11B and east of Ferry Point Road (see Figure G-1). It is approximately 5.3 acres in size, triangular in shape, and comprises Parcel 137 and subparcels 138A and 140A. Site 11 currently is considered a developed area consisting primarily of buildings, roads, and parking lots and is bordered by developed areas (EFA WEST 1999) (see Figure G-4).

Site 11 is known as Building 14 and was constructed in 1940 and operated as an aircraft testing and repair facility. Operations ceased in April 1997 (IT 2001). Site 11 also is designated as

CAA-11A and CAA-11B because of petroleum contamination in the groundwater at these locations. An OWS, 8 ASTs, 11 USTs, fuel lines, and storm sewers are physical features of concern at the site. See Section 7.0 of the RI for more information concerning the features of Site 11.

Site 11 is approximately 90 percent open space that was historically used for fuel storage (via USTs and ASTs), hazardous materials storage lockers, MOGAS refueling, miscellaneous parts and equipment storage, aircraft engine storage (in the northeast portion), trash disposal dumpsters, and chemical storage on the south side of Building 162 (ERM-West 1994). Currently the open areas are used as paved vehicle parking and storage areas. There is little vegetation occurring at Site 11. Typical urban wildlife, such as the California ground squirrel, scrub jays, and American robins, may be observed in the developed areas but to a lesser extent than in the landscaped areas because less foraging habitat is available. Feral cats also are found in the developed areas of Site 11 (EFA WEST 1999).

Site 21

Site 21 is located in the eastern portion of Alameda Point. The site is located south of West Sea Plane Lagoon Street, west of Viking Street, north of CAA-11B and east of Ferry Point Road (see Figure G-1). It is approximately 7 acres in size, irregularly shaped, and comprises Parcels 127, 135, 136, 200 and subparcel 155A. Site 21 is currently considered a developed area, consisting primarily of buildings, roads, and parking lots and is bordered by developed areas (EFA WEST 1999) (see Figure G-4).

The main feature of Site 21 is Building 162 , which was constructed in 1945 and operated as a ship and aircraft maintenance shop until operations ceased in April 1997 (IT 2001). The northern portion of Site 21 is designated as part of CAA-3A and the southwestern corner of the site is designated as part of CAA-11A because of petroleum contamination in the groundwater at these locations. An OWS, an AST, four USTs, underground fuel lines, and six RCRA sites are other physical features of concern at the site. See Section 8.0 of the RI for more information concerning the features of Site 21.

Approximately 50 percent of Site 21 is open space that historically was used as a smelting and storage area, parking lots, and storage areas (Pacific Aerial Surveys 1947). Currently the open areas are used as asphalt parking and storage areas, concrete storage aprons associated with buildings, and concrete paved areas near the Sea Plane Lagoon. Typical urban wildlife, such as the California ground squirrel, scrub jays, and American robins, may be observed in the developed areas but to a lesser extent than in the landscaped areas because less foraging habitat is available. Feral cats also are found in the developed areas of Site 21 (EFA WEST 1999).

Groundwater at OU-2B

The groundwater at OU-2B was addressed in this ERA on a plume basis because the groundwater plumes originating in different OU-2B sites have converged to form a large groundwater plume covering most of OU-2B. Based on the concentrations observed during the various groundwater sample events, this plume primarily is a TCE plume; however, data collected for all potential contaminants were evaluated for the ERA. Groundwater data that were evaluated were obtained from samples collected in 2000, the 2001 data gap sampling event, monitoring well sampling events in 2002 and 2003. Certain groundwater samples collected in 1998 also were included. Details pertaining to groundwater data and nature and extent can be found in Section 9.0 of the RI.

G.2.1.2 Selection of Ecological Chemicals of Potential Concern

The screening of chemicals for soils and groundwater was conducted as described in Section G.1 and presented in Figures G-2 and G-3 of this appendix. The data concerning the statistical comparison to background concentrations for inorganic constituents are presented in Appendix E of the RI.

Data concerning all detected chemicals for Sites 3, 4, 11, and 21 and the results of the screening process are presented in Tables G-22 through G-25 for soils and Table G-26 for groundwater. Based on the screening of ecological COPCs in surface soils at each of the sites and groundwater for the entire OU-2B, the following chemicals were retained for further evaluation:

<u>Site 3 Soils:</u> The metals aluminum, arsenic, barium, cobalt, copper, lead, manganese, vanadium, and zinc; the SVOCs 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene; and the VOCs 2-butanone, acetone, benzene, carbon disulfide, ethylbenzene, toluene, and xylene (see Table G-22).

<u>Site 4 Soils:</u> The metals antimony, arsenic, barium, cadmium, chromium, hexavalent chromium, copper, lead, manganese, mercury, molybdenum, nickel, silver, vanadium, and zinc; the SVOCs 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, n-nitrosodiphenylamine, naphthalene, pentachlorophenol, phenanthrene, and pyrene; the VOCs 1,1,1-TCA, ethylbenzene, toluene, and xylene (see Table G-23)

<u>Site 11 Soils:</u> The metals beryllium, cobalt, copper, lead, manganese, vanadium and zinc; the SVOCs 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene; and the VOC chloroform (see Table G-24).

<u>Site 21 Soils:</u> The metals aluminum, arsenic, barium, beryllium, cobalt, copper, lead, manganese, vanadium, and zinc; the PCB Aroclor 1260; the pesticides DDD and DDT; the SVOCs 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene,

benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene (see Table G-25).

OU-2B Groundwater: The metals aluminum, barium, chromium, cobalt, manganese, molybdenum, nickel, and vanadium; and the VOCs 1,2,4-trichloromethylbenzene, acetone, carbon disulfide, isopropylbenzene, tert-butanol, TCE, vinyl chloride, and xylene (see Table G-26).

G.2.1.3 Fate and Transport of Ecological Chemicals of Potential Concern

Physical properties of all of the ecological COPCs, with the exception of VOCs, indicate that they will bind preferentially to the soil and are relatively insoluble in water. Major ecological COPC movement will be through erosion processes, such as wind and surface water runoff, as well as infiltration to subsurface soils and groundwater.

G.2.1.4 Ecotoxicity Assessment

Ecological COPCs associated with the OU-2B sites include metals, pesticides, PCBs, PAHs, SVOCs, and VOCs. A literature review was conducted to identify the potential toxic effects of the ecological COPCs on ecological receptors. These ecological COPCs have a variety of effects dependent on species and trophic level. Known effects of these chemicals are described in Attachment A of this appendix.

The ecological effects evaluation was conducted as described in Section G.1 of this appendix. Tables G-4 through G-11 provide detailed information on the derivation of the TRVs and ERVs used to evaluate each measurement endpoint and ecological COPC for the OU-2B sites.

G.2.1.5 Potential Receptors

Tables G-1 and G-2 list species observed or potentially present at the OU-2B sites.

G.2.1.6 Exposure Pathways

Both existing and potential exposure pathways were identified for terrestrial receptors. Potential terrestrial exposure pathways to contaminated soil include direct contact, incidental ingestion, volatilization, windblown dust, and food chain effects. As requested by EPA and DTSC, the ERA assumes that all existing buildings and pavement at the OU-2B sites are removed and that the underlying soil provides suitable habitat for higher-trophic-level receptors.

Complete exposure pathways were assessed for Site 3, 4, 11, and 21 as discussed in Section G.1.2.2.5. The following discussion summarizes each potential exposure pathway under this scenario.

Direct Exposure to Soil. Animals in contact with the soil at the OU-2B sites can be exposed directly to metals, pesticides, PCBs, PAHs, SVOCs, and VOCs through ingestion and dermal contact. Direct exposure is expected to involve all trophic levels. Direct exposure to soil at the OU-2B sites is, therefore, a complete exposure pathway under the fully exposed soil scenario. In addition to the potential direct effects to receptors, contaminated soil at the sites is a probable source of ecological COPCs migrating to the underlying groundwater.

Direct Exposure to Surface Water. Precipitation and runoff infiltrates soil and moves to groundwater. The surface water pathway is considered to be a complete pathway for the sites; however, the only surface water available at the sites is ponded water that exists for a short period of time after rainfall events. Even though this exposure pathway is complete, it is not significant and was not evaluated. Because the groundwater at the OU-2B sites is expected to reach the Seaplane Lagoon, the groundwater discharge to surface water is a complete exposure pathway for marine receptors at these sites (Tetra Tech 2000).

Direct Exposure to Air. Many of the ecological COPCs associated with the OU-2B sites have extremely low volatilization rates. Ecological COPCs with low volatilization rates include metals (except mercury) and SVOCs. The exceptions are VOCs, which generally were detected at low levels in soil. Minimal volatilization from ecological COPCs from soil to the air is expected. Windblown dust could represent a complete exposure pathway because exposed soil exists at least on a portion of each of the OU-2B sites. The air exposure pathway is considered to be a complete exposure pathway under the fully exposed soil scenario, primarily resulting from airborne dust ingestion at OU-2B sites. Although this exposure pathway is complete, it is postulated to be insignificant compared to direct soil exposure.

Food Chain Exposure. A number of higher-trophic-level receptors could be exposed to ecological COPCs through diet. Of the ecological COPCs associated with OU-2B sites, Aroclor 1260, DDD, DDT, total HMW and LMW PAHs, bis(2-ethylhexyl)phthalate, n-nitrosodiphenylamine, pentachlorophenol, ethylbenzene, and xylene have a $_{Kow}$ greater than 3.0, which could indicate significant tendencies for these chemicals to bioaccumulate and biomagnify in food chains. Food chain exposure is a complete exposure pathway under the fully exposed soil scenario.

G.2.1.7 Assessment and Measurement Endpoints

Habitat associated with the OU-2B sites is of low ecological value because of current limited habitat existing at the sites. The sites are expected to have long-term reuse potential including research and development, light industrial, supporting retail, office, commercial, and residential uses. Community oriented institutions, such as places of worship and nonprofit organizations also are considered allowable and desirable uses. Based on the anticipated future uses of the sites, the value of the habitat is not expected to increase.

Ecological COPCs present at the OU-2B sites have different effects on different trophic levels. The assessment endpoints and associated measurement endpoints presented in Section G.1.2.2.6

of this appendix are necessary to adequately evaluate the risk to environmental receptors associated with the ecological COPCs.

G.2.2 EXPOSURE ESTIMATES AND RISK EVALUATION

For each measurement endpoint and ecological COPC, an estimate of the exposure of the organism to the ecological COPC was developed using life history information, site chemical concentrations, and other data. This exposure information was then compared with TRVs or ERVs to develop a QE of risk to ecological receptors.

Exposure estimates for each receptor were developed using the assumptions described in Section G.1.2.3.1 of this appendix. General exposure factors used for the California ground squirrel, Alameda song sparrow, American robin, and red-tailed hawk are presented in Table G-16. Risk calculations were conducted using the procedures described in Section G.1.2.3.2.

G.2.3 RESULTS OF THE ECOLOGICAL RISK ASSESSMENT FOR TERRESTRIAL RECEPTORS

HQs calculated for each site using high and low TRV values for each measurement endpoint are presented in Tables G-27 through G-30. HQs were evaluated based on the discussion presented in Section G.1.2.4. The following sections relate calculated HQs to assessment endpoints for each site and discuss these results. Uncertainties that exist in this ERA for the OU-2B sites are presented in Section G.1.2.5.

G.2.3.1 Ecological Risk Assessment Results for Site 3

The following sections contain the results of the ERA for Site 3 for each of the assessment endpoints evaluated. HQ values for Site 3 are presented in Table G-27.

G.2.3.1.1 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using either the high or low TRV value for mammals included aluminum, copper, lead, manganese, vanadium, zinc, toluene, and xylene (Table G-27). Literature data were not adequate to develop ERVs for 2-butanone, carbon disulfide, and ethylbenzene for small mammals. All other ecological COPCs presented in Table G-22 had HQ values of less than 1.0 and pose no significant risk to small mammals. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that requires a QE.

Aluminum: The high TRV HQ value for aluminum was 109, while the low TRV HQ value was 1,090. These values were only about 1.8 times above the background high and low HQs of 60 and 600, respectively. Aluminum was detected in all 14 samples collected at Site 3, with concentrations ranging from 3,820 mg/kg to 22,400 mg/kg, and background concentrations ranged from 1,760 mg/kg to 22,600 mg/kg. Based on these ranges of concentrations, aluminum appears to be naturally elevated in soils at Alameda. Aluminum is relatively nontoxic, with most adverse effects caused by inhalation of highly concentrated aluminum dust. Additionally, aluminum does not bioaccumulate in the food chains (Agency for Toxic Substances and Disease Registry [ATSDR] 1999a). Based on this information, aluminum poses no significant potential risk to small mammals at Site 3 above background concentrations.

Copper: The high TRV HQ value for copper was below 1.0. The low TRV HQ value was 3.75, which was more than 5 times the background HQ of 0.722. Copper was detected in 13 of 14 samples collected at Site 3. Concentrations detected at the site ranged from 4.9 mg/kg to 119 mg/kg, while background concentrations ranged from 3.12 mg/kg to 49.1 mg/kg. Not all of the copper ingested by mammals is absorbed in the gastrointestinal (GI) tract. Based on the ATSDR (1990a) "Toxicological Profile for Copper," information concerning GI absorption of copper in mammals is limited. Human studies indicate that on average, 60 percent of the ingested dose of copper is absorbed. Numerous factors, including the following may affect copper absorption: (1) competition with other metals, including zinc and cadmium; (2) the amount of copper in the stomach; (3) certain dietary components; and (4) the form of copper. Because zinc and cadmium also are present in soils at Site 3 and will compete with the absorption of copper, an absorption rate of 60 percent is assumed to be conservative, which would revise the low TRV HQ value to 2.25 (ATSDR 1990a). Based on this information, the potential risk to small mammals from copper at Site 3 cannot be discounted but is expected to be low.

Lead: The high TRV HQ value for lead was below 1.0. The low TRV HQ value was 8.63, which was over 60 times above the background HQ of 0.136. Lead was detected at Site 3 in 37 of 42 samples collected. The concentrations at the site ranged from 1.7 mg/kg to 3,870 mg/kg, while background concentrations ranged from 0.47 mg/kg to 165 mg/kg. Five sample locations exceeded a concentration of 100 mg/kg, and appear to represent two separate hotspots rather than a representation of soils at Site 3 (see Figure 5-11). Three of these samples are above 1,000 mg/kg and are skewing the calculated EPC of 634.15 mg/kg. If these 3 samples were removed from the dataset, the site EPC would be approximately 240 mg/kg, which would make the low TRV HQ 3.27. Additionally, the extent and rate of GI absorption of lead are influenced by the age of the organism; presence of essential nutrients, such as calcium and iron, in the diet; the physiological state of the organism, such as pregnancy; and the form of lead ingested (ATSDR 1999b). The absorption of lead in contaminated soil is lower than that of easily dissolvable forms, such as lead acetate. Absorption studies in rats determined that the bioavailability of ingested lead acetate was about 15 percent. Using this estimate, the "absolute" bioavailability of lead in soils from this study was 2.7 percent (ATSDR 1999b). Also, bioavailability of lead in soil decreased with increasing soil-lead concentration.

There are two small hotspot areas within Site 3 where concentrations of lead may represent a potential risk to small mammals. However, based on the low TRV HQ value, the limited areal extent of the hotspots skewing the dataset, and the low bioavailability of lead in soil, lead at Site 3 poses a low potential for risk to small mammals.

Manganese: The high TRV HQ for manganese was below 1.0. The low TRV HQ was 4.57, which was less than 2 times above the background HQ of 2.59. Manganese was detected in all 14 samples collected at Site 3. The concentrations at the site ranged from 76.1 mg/kg to 887 mg/kg, while background concentrations ranged from 55.5 mg/kg to 748 mg/kg. Based on these ranges of concentrations, manganese appears to be naturally elevated in soils at Alameda. Additionally, the GI absorption of manganese in animals is limited and affected by dietary intake of essential nutrients, such as calcium and iron (ATSDR 2000). Studies conducted on rats and pigs have documented a GI absorption that ranged from 2.5 to 8.2 percent. In general, high dietary intake of these nutrients lowers the uptake of manganese. Because calcium and iron are present in sufficient levels at Site 3, the uptake of manganese by animals is considered to be limited. Assuming a conservative absorption rate of 8.2 percent, a revised low TRV HQ value for manganese would be 0.37. Based on this information, manganese at Site 3 poses no significant potential for risk to small mammals.

Vanadium: The high HQ value for vanadium was less than 1.0. The low HQ value was 4.46, which was less than 2 times above the background HQ of 2.73. Vanadium was detected in all 14 samples collected at Site 3. Concentrations at the site ranged from 16 mg/kg to 69.3 mg/kg, while background concentrations ranged from 10.5 mg/kg to 55.3 mg/kg. Based on these ranges of concentrations, most of the vanadium dose to small mammals is attributable to background concentrations. Additionally, the GI absorption of vanadium is relatively low, with absorption ranging from 0.1 to 2.6 percent in rats (ATSDR 1992a). Based on this information, vanadium at Site 3 poses no significant potential for risk to small mammals.

Zinc: The high HQ value for zinc was less than 1.0. The low HQ value was 10.2, which was more than 7 times above the background HQ of 1.29. Zinc was detected in all 14 samples collected at Site 3. The concentrations ranged from 18 mg/kg to 1,260 mg/kg, while the background concentrations ranged from 9.98 mg/kg to 191 mg/kg. The sample containing 1,260 mg/kg appears to have been collected in a hotspot because the next highest concentration detected at the site was 108 mg/kg. This hotspot appears to be skewing the calculated EPC of 231.35 mg/kg. If this sample were removed from the dataset, the site EPC would be approximately 100 mg/kg, which would result in a low TRV HQ of 4.41. Additionally, zinc is generally nontoxic in mammals, and not all of the zinc ingested is absorbed in the GI tract. Based on the ATSDR (1994a) "Toxicological Profile for Zinc," information concerning GI absorption of zinc in mammals is limited. Human studies indicate that on average, 20 to 30 percent of the ingested dose of zinc is absorbed. An absorption rate of 30 percent is assumed to be conservative for small mammal endpoints, which would revise the low TRV HQ value for zinc to 3.06 (ATSDR 1994a). There is one small hotspot area within Site 3 where concentrations of zinc may represent a potential risk to small mammals. However, based on the low TRV HQ value, the limited areal extent of the hotspots skewing the dataset, and the low bioavailability and toxicity of zinc in soil, zinc at Site 3 poses a low potential for risk to small mammals.

Xylene and Toluene: The HQ value for toluene using the high TRV was 2.37, while the low TRV HQ value was 23.7. The high TRV HQ for xylene was 662, while the low TRV HQ value was 815. Toluene was detected in 6 of 13 samples at concentrations ranging from 0.002 mg/kg to 210 mg/kg, while xylene was detected only in 2 of 13 samples at concentrations of 2.3 mg/kg and 250 mg/kg. Except for short-term hazards from concentrated spills, toluene frequently has been associated more with risk to humans than with risk to other species such as fish and wildlife. This is partly because plants, fish, and birds take up only very small amounts and because this VOC tends to evaporate into the atmosphere rather than persist in surface waters or soils (ATSDR 1994b).

Large amounts of xylene can cause changes in the liver and harmful effects in the kidneys, heart, lungs, and nervous system (ATSDR 1993). Long-term exposures of animals to low doses of xylene have not been well studied (ATSDR 1993).

The HQ values for toluene and xylene are driven by the relatively conservative $_{BCFssoil\text{-}to\text{-}invert}$ of 12.3 and 29.84, respectively, which were calculated using the $_{Kows}$ of 2.73 and 3.2. Based on these factors, the ecological risk of toluene and xylene to small mammals cannot be discounted fully, but are expected to be low.

Other VOCs: The literature data were not adequate to develop ERVs for small mammals for the VOCs 2-butanone, carbon disulfide, and ethylbenzene. 2-butanone and carbon disulfide were detected in 1 of 13 samples collected at Site 3. The maximum concentrations for both of these chemicals were below the maximum reporting limit of 13 mg/kg. Ethylbenzene was detected in 2 of 13 samples at concentrations of 0.94 mg/kg and 50 mg/kg. In general, VOCs will have toxic effects only at higher concentrations, in the 500 to 1,000 mg/kg range (ATSDR 1992b, 1996a, 1996b). Based on this information, the low detection frequency, and the relatively low concentrations, the impact to small mammals from the residual levels of VOCs at Site 3 is expected to be low.

G.2.3.1.2 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area

Lead was the only ecological COPC that exceeded an HQ of 1.0 for the Alameda song sparrow, while aluminum and lead exceeded an HQ of 1.0 for the American robin (Table G-27). Literature data were not adequate to develop ERVs for cobalt, HMW PAHs, LMW PAHs, 2-butanone, acetone, benzene, carbon disulfide, ethylbenzene, toluene, and xylene. All other ecological COPCs presented in Table G-22 had HQ values of less than 1.0 and pose no significant risk to passerines. The following sections discuss each chemical or chemical grouping that requires a QE.

Aluminum: The high TRV HQ value for aluminum for the American robin was below 1.0. The low HQ value was 3.09, which was less than twice the background HQ of 1.71. Aluminum was detected in all 14 samples collected at Site 3, with concentrations ranging from 3,820 mg/kg to 22,400 mg/kg, while background concentrations ranged from 1,760 mg/kg to 22,600 mg/kg. Based on these ranges of concentrations, aluminum appears to be naturally elevated in soils at Alameda. Aluminum is relatively nontoxic, with most adverse effects caused by inhalation of highly concentrated aluminum dust. Additionally, aluminum does not bioaccumulate in food chains (ATSDR 1999a). Based on this information, aluminum poses no significant potential risk to passerines at Site 3.

Cobalt: The literature data were not adequate to develop avian ERVs for the metal cobalt. Cobalt was detected in 10 of 14 samples collected at Site 3 at concentrations ranging from 4.4 mg/kg to 11.1 mg/kg. Background concentrations of cobalt ranged from 3.02 mg/kg to 49.7 mg/kg. Based on these ranges of concentrations, cobalt appears to be naturally elevated in soils at Alameda. Very little information is available concerning the effects of cobalt on passerine species. Potential impact to passerines from exposure to cobalt at Site 3 is not expected to be above background risks.

Lead: HQs for the Alameda song sparrow and the American robin using the high TRV for lead were below 1.0. The song sparrow and the robin low TRV HQs for lead were 228 and 763, which exceeded the background HQs of 3.59 and 12, respectively. Lead was detected in 37 of 42 samples collected from Site 3 at concentrations ranging from 1.7 mg/kg to 3,870 mg/kg. As discussed in Section G.2.3.1.1, two small hotspot areas of lead occur at Site 3, which is skewing (on the high side) the EPC used in the risk calculations. The EPC decreases from 634.15 mg/kg to approximately 240 mg/kg, when the 3 highest sample results, all above 1,000 mg/kg, are removed from the dataset. Additionally, the HQ values may be driven by an overly conservative low TRV value of 0.014 mg/kg-day. This TRV was originally developed by the Navy and the EPA Region 9 BTAG and is based on a study by Edens and others (1976) that found that physiological effects on birds measurable at a dose of 0.014 mg/kg-day are not believed to be ecologically significant. When the HQ was calculated using an alternative TRV value of 3.85 mg/kg-day, developed by Oak Ridge National Laboratory for the U.S. Department of Energy, the lead HQ value was reduced significantly. This TRV was established based on a study by Pattee (1984), which administered inorganic lead to an avian receptor. Using an allometrically converted TRV of 36.6 mg/kg-day for song sparrows and 6.79 mg/kg-day for robins, reevaluation of the lead HQ at Site 3 was calculated as 0.629 for the song sparrow with a background HQ of 0.0099, and an HQ of 2.1 for the robin with a background HQ of 0.0331. When the alternate low TRVs for the song sparrow and robin were used with the unskewed EPC of 240 mg/kg, the resulting HQs were 0.238 and 0.796, respectively.

There are two small hotspot areas within Site 3 where concentrations of lead may represent a potential risk to passerines. However, based on the alternate low TRV HQ value, the limited areal extent of the hotspots skewing the dataset, and the low bioavailability of lead in soil, lead at Site 3 poses a low potential for risk to passerines.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The LMW and HMW PAHs were detected in 49 to 94 percent from a total of 156 samples collected at Site 3. The EPCs calculated for the chemicals ranged from 0.015 to 1.05 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987). Given the relatively high frequency of detection, the risk posed to passerines from HMW and LMW PAHs associated with Site 3 cannot be discounted.

VOCs: The literature data were not adequate to develop avian ERVs for the VOCs 2-butanone, acetone, benzene, carbon disulfide, ethylbenzene, toluene, and xylene. These compounds were detected in 6 of 13 samples collected at Site 3. Concentrations ranged from 0.01 mg/kg to

250 mg/kg. In general, VOCs will have toxic effects only at higher concentrations, in the 500 to 1,000 mg/kg range (ATSDR 1992b, 1996a, 1996b). Based on this information, the low detection frequency, and the relatively low concentrations, the impact to passerines from residual levels of VOCs at Site 3 is expected to be low.

G.2.3.1.3 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area

Aluminum and lead were the only ecological COPCs that exceeded an HQ of 1.0 for the redtailed hawk (Table G-27). Literature data were not adequate to develop ERVs for cobalt, HMW PAHs, LMW PAHs, 2-butanone, acetone, benzene, carbon disulfide, ethylbenzene, toluene, and xylene. All other ecological COPCs presented in Table G-22 had HQ values of less than 1.0 and pose no significant risk to raptors. The following sections discuss each chemical or chemical grouping that requires a QE.

Aluminum: The high TRV HQ value for aluminum for the red-tailed hawk was 1.77, while the low TRV HQ value was 16.2. These values were about 1.8 times above the background high and low HQs of 0.98 and 8.96, respectively. Aluminum was detected in all 14 samples collected at Site 3, with concentrations ranging from 3,820 mg/kg to 22,400 mg/kg, while background concentrations ranged from 1,760 mg/kg to 22,600 mg/kg. Based on these ranges of concentrations, aluminum appears to be naturally elevated in soils at Alameda. Aluminum is relatively nontoxic, with most adverse effects caused by inhalation of highly concentrated aluminum dust. Additionally, aluminum does not bioaccumulate in food chains (ATSDR 1999a). Based on this information, aluminum poses no significant potential risk to raptors at Site 3 above background concentrations.

Cobalt: The literature data were not adequate to develop avian ERVs for the metal cobalt. Cobalt was detected in 10 of 14 samples collected at Site 3 at concentrations ranging from 4.4 mg/kg to 11.1 mg/kg. Background concentrations of cobalt ranged from 3.02 mg/kg to 49.7 mg/kg. Based on these ranges of concentrations, cobalt appears to be naturally elevated in soils at Alameda. Very little information is available concerning the effects of cobalt on raptor species. Potential impact to raptors from exposure to cobalt at Site 3 is not expected to be above background.

Lead: The high TRV HQ value for lead for the red-tailed hawk was below 1.0. The low TRV HQ value was 1,840, which was over 60 times higher than the background HQ of 29. This HQ may be driven by a skewed dataset from two small hotspot areas, as discussed in Section G.2.3.1.1, and by an inappropriately conservative low TRV, as discussed in G.2.3.1.2. When the HQ was calculated for the red-tailed hawk using the alternate allometrically converted TRV of 0.287 mg/kg-day, the HQ for lead at Site 3 was 5.07, with a background HQ of 0.0798. When the alternate low TRV for the red-tailed hawk was used with the unskewed EPC of 240 mg/kg, the resulting HQ was 1.92.

There are two small hotspot areas within Site 3 where concentrations of lead may represent a potential risk to raptors. However, based on the alternate low TRV HQ value, the limited areal extent of the hotspots skewing the dataset, and the low bioavailability of lead in soil, lead at Site 3 poses a low potential for risk to raptors.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The LMW and HMW PAHs were detected in 49 to 94 percent from a total of 156 samples collected at Site 3. The EPCs calculated for the chemicals ranged from 0.015 mg/kg to 1.05 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987). Given the relatively high frequency of detection, the risk posed to raptors from HMW and LMW PAHs associated with Site 3 cannot be discounted.

VOCs: The literature data were not adequate to develop avian ERVs for the VOCs 2-butanone, acetone, benzene, carbon disulfide, ethylbenzene, toluene, and xylene. These compounds were detected in 6 of 13 samples collected at Site 3. Concentration ranged from 0.01 mg/kg to 250 mg/kg. In general, VOCs will have toxic effects only at higher concentrations, in the 500 to 1,000 mg/kg range (ATSDR 1992b, 1996a, 1996b). Based on this information, the low detection frequency, and the relatively low concentrations, the impact to passerines from residual levels of VOCs at Site 3 is expected to be low.

G.2.3.1.4 Discussion of Conclusions of the Ecological Risk Assessment for Site 3

Results of the modified ERA for Site 3 indicated potential risk to small mammals, passerines, and raptors from lead; however most of the risk from lead appears to be from two small hotspot areas (see Figure 5-11). There also is a potential risk to small mammals from a small hotspot area of zinc. Based on available information, the impact to passerines and raptors from residual levels of PAHs cannot be discounted. Also, the impact to mammals from residual levels of copper, xylene, and toluene cannot be discounted. However, the risk of exposure to these chemicals will be low based on the lack of habitat for these receptor populations at Site 3.

G.2.3.2 Ecological Risk Assessment Results for Site 4

The following sections present the results of the ERA for Site 4 for each of the assessment endpoints evaluated. HQ values for Site 4 are presented in Table G-28.

G.2.3.2.1 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using either the high or low TRV value for mammals included cadmium, copper, manganese, molybdenum, nickel, vanadium, zinc, bis(2-ethylhexyl)phthalate, and pentachlorophenol (Table G-28). Literature data were not adequate to develop ERVs for silver, n-nitroso-diphenylamine, and ethylbenzene for small mammals. All other ecological COPCs presented in Table G-23 had HQ values of less than 1.0 and pose no significant risk to small mammals. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that requires a QE.

Cadmium: The high TRV HQ value for cadmium was 2.37, while the low TRV HQ value was 102. These HQs were over 19 times above the background HQs of 0.121 and 5.2, respectively. Cadmium was detected in 37 of 79 soil samples collected at Site 4 at concentrations ranging from 0.1 mg/kg to 105 mg/kg, while background concentrations ranged from 0.1 mg/kg to 0.82 mg/kg. Only 4 of the detected samples had cadmium concentrations above the maximum background concentration, while 1 of these samples was above 100 mg/kg. These samples represent small hotspots that are not representative of cadmium concentrations throughout Site 4. Additionally, cadmium is a known teratogen in mammals; however, the GI absorption of cadmium in mammals is very limited. Based on the ATSDR (1999c) "Toxicological Profile for Cadmium," GI absorption of cadmium in mammals ranges from 0.5 to 3 percent for monkeys, 1 to 2 percent for mice and rats, 2 percent for goats, 5 percent for pigs and lambs, and 16 percent for cattle. Assuming a conservative absorption rate of 16 percent, revised high and low TRV HQ values for cadmium would be 0.379 and 16.3, respectively. Based on these factors, cadmium at Site 4 poses a potential for risk to small mammals.

There are small hotspot areas within Site 4 where concentrations of cadmium may represent a potential risk to small mammals. However, based on the low TRV HQ value, the limited areal extent of the hotspots skewing the dataset, and the low bioavailability of cadmium in soil, cadmium at Site 4 poses a low potential for risk to small mammals.

Copper: The high TRV HQ value for copper was below 1.0. The low TRV HQ value was 1.67, which was less than 2 times the background HQ of 1.05. Copper was detected in 70 of 71 samples collected at Site 4. Concentrations detected at the site ranged from 4.3 mg/kg to 326 mg/kg, while background concentrations ranged from 4.2 to 89.4 mg/kg. As discussed in Section 2.3.1.1, not all of the copper ingested by mammals is absorbed in the GI tract (ATSDR 1990a). An absorption rate of 60 percent is assumed to be conservative, which would revise the low TRV HQ value to 1.0. Based on this information, the potential risk to small mammals from copper at Site 4 is expected to be low.

Manganese: The high TRV HQ for manganese was below 1.0. The low TRV HQ was 2.2, which was not above the background HQ of 2.47. Manganese was detected in all 68 samples collected at Site 4. The concentrations at the site ranged from 72 mg/kg to 306 mg/kg, while background concentrations ranged from 50 mg/kg to 1,060 mg/kg. Based on these ranges of concentrations, manganese appears to be naturally elevated in soils at Alameda. Based on this information, manganese at Site 4 does not pose a significant risk to small mammals above background concentrations.

Molybdenum: The high HQ value for molybdenum was below 1.0. The low TRV HQ value was 2.1. Molybdenum was not detected in background soils. Molybdenum was detected in only 5 of 48 samples collected from Site 4, with concentrations ranging from 0.72 mg/kg to 3.1 mg/kg. Molybdenum is an essential nutrient in mammalian diets, can protect against poisoning by copper or mercury, and may be useful in reducing cancer risks. Cattle and sheep that grazed in fields with high levels of molybdenum and low levels of copper and inorganic sulfate developed molybdenosis (Eisler 1989). A copper to molybdenum ratio of at least 5 to 1 is said to mitigate any toxic effects from molybdenosis (Osweiler and others 1976). All evidence indicates that mammals other than cattle and sheep are comparatively tolerant of high dietary intakes of molybdenum (Underwood 1971, Buck 1978, Chappell and Others 1979, and Friberg and Lener 1986, as cited in Eisler 1989). The copper to molybdenum ratio at Site 4 is 6 to 1; therefore, the low levels of molybdenum are not expected to pose a significant potential for risk to small mammals.

Nickel: The high HQ value for nickel was less than 1.0. The low HQ value was 5.01, which was 2 times above the background HQ of 2.45. Nickel was detected in all 71 samples collected at Site 4 at concentrations ranging from 17 mg/kg to 1,400 mg/kg. The 1,400 mg/kg maximum detected value appears to be an outlier as the EPC was calculated as 64.8 mg/kg. Background concentrations ranged from 11.6 mg/kg to 88.5 mg/kg. Only 2 of the detected samples had nickel concentrations above 170 mg/kg. These samples represent small hotspots that are not representative of nickel concentrations throughout Site 4. Additionally, GI absorption studies in dogs and rats indicate that only 1 to 10 percent of nickel, nickel sulfate, or nickel chloride in the diet is absorbed (ATSDR 1997). Assuming a conservative absorption rate of 10 percent, a revised low TRV HQ value for nickel would be 0.501.

There are small hotspot areas within Site 4 where concentrations of nickel may represent a potential risk to small mammals. However, based on the low TRV HQ value, the limited areal extent of the hotspots skewing the dataset, and the low bioavailability of nickel in soil, nickel at Site 4 poses a low potential for risk to small mammals.

Silver: The literature data were not adequate to develop a mammalian ERV for the metal silver. Silver was detected in 30 of 71 samples collected with concentrations ranging from 0.8 mg/kg to 81.1 mg/kg. Silver was detected in 2 of 88 background soil samples collected from Alameda Point with concentrations ranging from 0.44 mg/kg to 0.61 mg/kg. Very little information is available concerning the effects of silver on mammalian species. Potential impact to small mammals cannot be discounted but is expected to be low.

Vanadium: The high HQ value for vanadium was less than 1.0. The low HQ value was 2.46, which was not above the background HQ of 2.63. Vanadium was detected in all 68 samples collected at Site 4. Concentrations at the site ranged from 13 mg/kg to 35 mg/kg, while background concentrations ranged from 12.8 mg/kg to 62.3 mg/kg. Based on these ranges of concentrations, vanadium appears to be naturally elevated in soils at Alameda. Based on this information, vanadium at Site 4 does not pose a significant risk to small mammals above background concentrations.

Zinc: The high HQ value for zinc was less than 1.0. The low HQ value was 1.69, which was less than 2 times above the background HQ of 1.37. Zinc was detected in all 68 samples collected at Site 4. The concentrations ranged from 13.6 mg/kg to 283 mg/kg, while the background concentrations ranged from 14 mg/kg to 84 mg/kg. Zinc is generally nontoxic in mammals, and not all of the zinc ingested is absorbed in the GI tract. As discussed in Section

2.3.1.1, an absorption rate of 30 percent is assumed to be conservative for small mammal endpoints, which would revise the low TRV HQ value for zinc to 0.507 (ATSDR 1994a). Based on these factors, zinc at Site 4 poses no significant potential for risk to small mammals.

Bis(2-ethylhexyl)phthalate: The HQ value for bis(2-ethylhexyl)phthalate using the high TRV was 5.19, and the low TRV HQ value was 51.9. Bis(2-ethylhexyl)phthalate was detected in only 2 of 95 samples at concentrations of 0.69 mg/kg and 7.6 mg/kg. These high HQ values are attributable to the conservative $BCF_{soil-to-invert}$ value of 1,309. This value is based upon the high K_{ow} value of 7.6. Based on the low frequency of detection and the overestimation likely caused by calculating the BCFs, the risk of bis(2-ethylhexyl)phthalate to small mammals at Site 4 is expected to be low.

Pentachlorophenol: The HQ value using the high TRV was 3.06, and the low TRV HQ value was 30.6. Pentachlorophenol was detected in only 1 of 95 samples at a concentration of 0.13 mg/kg. The relatively high HQ values are directly attributable to the conservative $BCF_{soil-to-invert}$ value of 1,034 (EPA 1999b). This value was calculated based on the K_{Ow} value of 5.12 and the fact that pentachlorophenol is absorbed rapidly by ecological receptors. In mammals, however, the degree of accumulation into the tissues is small because pentachlorophenol is efficiently and rapidly excreted (EPA 1999b). Based on these factors, the potential risk to small mammals from exposure to pentachlorophenol at Site 4 is expected to be low.

SVOCs: The literature data were not adequate to develop an ERV for small mammals for the SVOC n-nitroso-diphenylamine. N-Nitroso-diphenylamine was detected in 3 of 95 samples, which is only 3 percent of the total samples collected. The maximum detected value was 0.32 mg/kg, which is below the maximum reporting limit of 3.8 mg/kg. The impact on small mammals from n-nitroso-dipheynlyamine is not well documented; however, based on the low frequency of detection and low concentration, the impact is expected to be low.

VOCs: The literature data were not adequate to develop a mammalian ERV for the VOC ethylbenzene. Ethylbenzene was detected in 21 of 61 samples at concentrations ranging from 0.001 mg/kg to 0.028 mg/kg. In general, VOCs will have toxic effects only at higher concentrations, in the 500 to 1,000 mg/kg range (ATSDR 1992b, 1996a, 1996b). Based on these factors, the impact to small mammals from the residual levels of ethylbenzene at Site 4 cannot be discounted but is expected to be low.

G.2.3.2.2 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area

Lead and bis(2-ethylhexyl)phthalate were the only ecological COPCs that exceeded an HQ of 1.0 for the Alameda song sparrow, while cadmium, lead, and bis(2-ethylhexyl)phthalate exceeded an HQ of 1.0 for the American robin (Table G-28). Literature data were not adequate to develop ERVs for silver, HMW PAHs, LMW PAHs, n-nitroso-diphenylamine, pentachlorophenol, 1,1,1-TCA, ethylbenzene, toluene, and xylene. All other ecological COPCs presented in Table

G-23 had HQ values of less than 1.0 and pose no significant risk to passerines. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that requires a QE.

Cadmium: The high TRV HQ value for cadmium for the robin was below 1.0. The low TRV HQ value was 1.78, which was over 19 times above the background HQ of 0.0911. Cadmium was detected in 37 of 79 soil samples collected at Site 4 at concentrations ranging from 0.1 mg/kg to 105 mg/kg, and background concentrations ranged from 0.1 mg/kg to 0.82 mg/kg. As discussed in Section G.2.3.2.1, only 4 samples exceeded the maximum background concentration and represent hotspots. Additionally, sublethal effects of cadmium in birds include growth retardation, nephrotoxicity, anemia, damage to the testicles and absorptive epithelium of the duodenum, reduced egg production, and effects on calcium absorption (Scheuhammer 1987).

There are small hotspot areas within Site 4 where concentrations of cadmium may represent a potential risk to passerines. However, based on the low TRV HQ value, the limited areal extent of the hotspots skewing the dataset, and the low bioavailability of cadmium in soil, cadmium at Site 4 poses a low potential for risk to passerines.

Lead: HQs for the Alameda song sparrow and the American robin using the high TRV for lead were below 1.0. The song sparrow and the robin low TRV HQs for lead were 19.8 and 66.2, which exceeded the background HQs of 2.71 and 9.07, respectively. These HQs may, however, be driven by the overly conservative low TRV value as described in Section G.2.3.1.2. Using the allometrically converted TRVs, reevaluation of the lead low TRV HQ at Site 4 was calculated as 0.0545 for the song sparrow with a background HQ of 0.00748, and an HQ of 0.182 for the robin with a background HQ of 0.025. Based on this information, lead at Site 4 poses no significant potential for risk to passerines.

Silver: The literature data were not adequate to develop an avian ERV for silver. Silver was detected in 30 of 71 samples collected with concentrations ranging from 0.8 to 81.1 mg/kg. Silver was detected in 2 of 88 background soil samples collected from Alameda Point with concentrations ranging from 0.44 mg/kg to 0.61 mg/kg. Very little information is available concerning the effects of silver on avian species. Potential impact to passerines cannot be discounted but is expected to be low.

Bis(2-ethylhexyl)phthalate: For the Alameda song sparrow the high HQ for bis(2-ethylhexyl)phthalate was 197, while the low TRV HQ was 1,970. For the American robin the high HQ was 15.5 and the low TRV HQ was 155. Bis(2-ethylhexyl)phthalate was detected in only 2 of 95 samples at concentrations of 0.69 mg/kg and 7.6 mg/kg. These high HQ values are directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 1,309. This value is based on the high K_{ow} value of 7.6. Based on these factors, the risk of bis(2-ethylhexyl)phthalate to passerines is expected to be low.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The LMW and HMW PAHs were detected 36 to 90 percent of the samples collected at Site 4. The EPCs calculated for the chemicals ranged from 0.014 mg/kg to 0.201 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987). Given the relatively high frequency of detection, the risk posed to passerines from HMW and LMW PAHs associated with Site 4 cannot be discounted; however, based on the low concentrations of chemicals, this risk is expected to be low.

SVOCs: The literature data were not adequate to develop avian ERVs for the SVOCs n-nitroso-diphenylamine and pentachlorophenol. N-Nitroso-diphenylamine was detected at Site 4 in 3 of 95 samples collected, which is only 3 percent of the total samples collected. The maximum detected value was 0.32 mg/kg, which is below the maximum reporting limit of 3.8 mg/kg. Pentachlorophenol was detected in 1 of 95 samples collected at a concentration of 0.13 mg/kg, which is below the maximum reporting-limit of 19 mg/kg. The impacts of these SVOCs on wildlife are not well documented; however, based on the low frequency of detection and low concentration, the impact is expected to be low.

VOCs: The literature data were not adequate to develop avian ERVs for the VOCs 1,1,1-TCA, ethylbenzene, toluene, and xylene. These chemicals were detected in 5, 21, 15, and 30 out of 62 samples collected at Site 4, respectively. Concentration ranged from 0.001 mg/kg to 0.19 mg/kg. In general, VOCs will have toxic effects only at higher concentrations, in the 500 to 1,000 mg/kg range (ATSDR 1992b, 1996a, 1996b). Mixtures of VOCs with other aromatics, such as, PAHs, alkyl PAHs, and benzene, may be more toxic or hazardous, in general, than the chemical would be alone (Hazardous Substance Database [HSDB] 1999). The impact to passerines from residual levels of VOCs at Site 4 cannot be discounted; however, this risk is expected to be low given the low concentrations in soils.

G.2.3.2.3 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using either the high or low TRV value for raptors included cadmium, lead, and bis(2-ethylhexyl)phthalate (Table G-28). Literature data were not adequate to develop ERVs for silver, HMW PAHs, LMW PAHs, n-nitroso-diphenylamine, pentachlorophenol, 1,1,1-TCA, ethylbenzene, toluene, and xylene. All other ecological COPCs presented in Table G-23 had HQ values of less than 1.0 and pose no significant risk to raptors. The following sections discuss each chemical or chemical grouping that requires a QE.

Cadmium: The high TRV HQ for cadmium was 1.17, while the low TRV HQ was 10.2. Both of these values exceeded the respective cadmium high and low TRV HQs for background soils of 0.0596 and 0.522. Cadmium was detected in 37 of 79 soil samples collected at Site 4 at concentrations ranging from 0.1 mg/kg to 105 mg/kg, and background concentrations ranged from 0.1 mg/kg to 0.82 mg/kg. As discussed in Section G.2.3.2.1, only 4 samples exceeded the maximum background concentration and represent hotspots. Sublethal effects in birds include growth retardation, nephrotoxicity, anemia, damage to the testicles and absorptive epithelium of the duodenum, reduced egg production, and effects on calcium absorption (Scheuhammer 1987). Cadmium at Site 4 poses a potential risk to raptors.

There are small hotspot areas within Site 4 where concentrations of cadmium may represent a potential risk to raptors. However, based on the low TRV HQ value, the limited areal extent of the hotspots skewing the dataset, and the low bioavailability of cadmium in soil, cadmium at Site 4 poses a low potential for risk to raptors.

Lead: The high TRV HQ value for lead for the red-tailed hawk was less than 1.0. The low TRV HQ value was 160, which was over 7 times higher than the background HQ value of 21.9. However, as discussed in Section G.2.3.1.2, the Navy believes that this HQ value may be driven by an inappropriately conservative low TRV. When the HQ was calculated for the red-tailed hawk using the alternate allometrically converted TRV of 0.287, the HQ for lead at Site 4 was 0.44, with a background HQ of 0.0798. Based on this information, lead at Site 4 poses no significant potential for risk to raptors.

Silver: The literature data were not adequate to develop an avian ERV for silver. Silver was detected in 30 of 71 samples collected at Site 4 with concentrations ranging from 0.8 mg/kg to 81.1 mg/kg. Silver was detected in 2 of 88 background soil samples collected from Alameda Point with concentrations ranging from 0.44 mg/kg to 0.61 mg/kg. Very little information is available concerning the effects of silver on avian species; the potential impact to raptors cannot be discounted but is expected to be low.

Bis(2-ethylhexyl)phthalate: The high TRV HQ for bis(2-ethylhexyl)phthalate for the red-tailed hawk was 1,180, while the low TRV HQ was 10,800. Bis(2-ethylhexyl)phthalate was detected in only 2 of 95 samples at concentrations of 0.69 mg/kg and 7.6 mg/kg. As discussed for small mammals, these high HQ values are directly attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 1,309. Based on these factors, the risk of bis(2-ethylhexyl)phthalate to raptors is expected to be low.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The LMW and HMW PAHs were detected 36 to 90 percent of the samples collected at Site 4. The EPCs calculated for the chemicals ranged from 0.014 mg/kg to 0.201 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987). Given the relatively high frequency of detection, the risk posed to raptors from HMW and LMW PAHs associated with Site 4 cannot be discounted.

SVOCs: The literature data were not adequate to develop avian ERVs for the SVOCs n-nitroso-diphenylamine and pentachlorophenol. N-Nitroso-diphenylamine was detected at Site 4 in 3 of 95 samples collected, which is only 3 percent of the total samples collected. The maximum detected value was 0.32 mg/kg, which is below the maximum reporting limit of 3.8 mg/kg. Pentachlorophenol was detected in 1 of 95 samples collected at a concentration of 0.13 mg/kg, which is below the maximum reporting-limit of 19 mg/kg. The impact of these SVOCs on wildlife is not well documented; however, based on the low frequency of detection and low concentration, the impact is expected to be low.

VOCs: The literature data were not adequate to develop avian ERVs for the VOCs 1,1,1-TCA, ethylbenzene, toluene, and xylene. These chemicals were detected in 5, 21, 15, and 30 of 62 samples collected at Site 4, respectively. Concentration ranged from 0.001 mg/kg to 0.19 mg/kg. In general, VOCs will have toxic effects only at higher concentrations, in the 500 to 1,000 mg/kg range (ATSDR 1992b, 1996a, 1996b). Mixtures of VOCs with other aromatics, such as, PAHs, alkyl PAHs, and benzene, may be more toxic or hazardous, in general, than the chemical would be alone (HSDB 1999). The impact to raptors from residual levels of VOCs at Site 4 cannot be discounted; however, given the low concentrations in soils this risk is expected to be low.

G.2.3.2.4 Discussion of Conclusions of the Ecological Risk Assessment for Site 4

Results of the modified ERA for Site 4 indicated potential risk to small mammals and raptors from lead. The impact to passerines and raptors from residual levels of silver and PAHs cannot be discounted. Also, the impact to mammals from residual levels of copper and silver cannot be discounted. However, the risk of exposure to these chemicals will be low based on the lack of habitat for these receptor populations at Site 4.

G.2.3.3 Ecological Risk Assessment Results for Site 11

The following sections contain the results of the ERA for Site 11 for each of the assessment endpoints evaluated. HQ values for Site 11 are presented in Table G-29.

G.2.3.3.1 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using either the high or low TRV value for mammals included copper, lead, manganese, vanadium, and zinc (Table G-29). All other ecological COPCs presented in Table G-24 had HQ values of less than 1.0 and pose no significant risk to small mammals. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that requires a QE.

Copper: The high TRV HQ value for copper was below 1.0. The low TRV HQ value was 1.97, which was more than 3 times the background HQ of 0.722. Copper was detected in 28 of 30 samples collected at Site 11, with concentrations ranging from 4.77 mg/kg to 83.2 mg/kg. Background concentrations ranged from 3.12 mg/kg to 49.1 mg/kg. As discussed in Section G.2.3.1.1, not all of the copper ingested by mammals is absorbed in the GI tract. An absorption rate of 60 percent is assumed to be conservative, which would revise the low TRV HQ value to 1.18. Based on this information, the potential risk to small mammals from copper at Site 11 cannot be discounted but is expected to be low.

Lead: The high TRV HQ value for lead was below 1.0. The low TRV HQ value was 1.4, which was over 10 times above the background HQ of 0.136. Lead was detected at Site 11 in 27 of

30 samples collected, with concentrations at the site ranging from 0.78 mg/kg to 242 mg/kg. Background concentrations range from 0.47 mg/kg to 165 mg/kg. As discussed in Section G.2.3.1.1, GI absorption of lead in soils is limited (ATSDR 1999b). Based on this information and the relatively low TRV HQ value (only slightly above 1.0), lead at Site 11 poses no significant potential for risk to small mammals.

Manganese: The high TRV HQ value for manganese was less than 1.0. The low TRV HQ value was 3.94, which was less than 2 times higher than the background HQ of 2.59. Manganese was detected in all 30 samples collected at Site 11, with concentrations at the site ranging from 60.6 mg/kg to 558 mg/kg. Background concentrations ranged from 55.5 mg/kg to 748 mg/kg. Based on these ranges of concentrations, manganese appears to be naturally elevated in soils at Alameda. Additionally, as discussed in Section G.2.3.1.1, the GI absorption of manganese in animals is limited and affected by dietary intake of essential nutrients, such as calcium and iron (ATSDR 2000). Assuming a conservative absorption rate of 8.2 percent, the revised low TRV HQ value for manganese would be 0.323. Based on this information, manganese at Site 11 poses no significant potential for risk to small mammals.

Vanadium: The high HQ value for vanadium was less than 1.0. The low HQ value was 3.56, which was less than 2 times higher than the background HQ of 2.73. Vanadium was detected in all 30 samples collected at Site 11. Concentrations at the site ranged from 14.5 mg/kg to 82.5 mg/kg, while background concentrations ranged from 10.5 mg/kg to 55.3. Based on these ranges of concentrations, most of the vanadium dose to small mammals is attributable to background concentrations. Additionally, the GI absorption of vanadium is relatively low, with absorption ranging from 0.1 to 2.6 percent in rats (ATSDR 1992a). Based on this information, vanadium at Site 11 poses no significant potential for risk to small mammals above background concentrations.

Zinc: The high HQ value for zinc was less than 1.0. The low TRV HQ value was 2.09, which was less than 2 times above the background HQ of 1.29. Zinc was detected in all 30 samples collected at Site 11. The concentrations ranged from 16.1 mg/kg to 196 mg/kg, while the background concentrations ranged from 9.98 mg/kg to 191 mg/kg. Based on these ranges of concentrations, most of the zinc dose to small mammals is attributable to background concentrations. Additionally, as discussed in Section G.2.3.1.1, zinc is generally nontoxic in mammals, and not all of the zinc ingested is absorbed in the GI tract. Assuming a conservative absorption rate of 30 percent, the revised low TRV HQ value for zinc would be 0.627 (ATSDR 1994a). Based on this information, zinc at Site 11 poses no significant potential for risk to small mammals above background concentrations.

G.2.3.3.2 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area

Lead was the only ecological COPCs with an HQ above 1.0 using the low TRV values for the Alameda song sparrow and the American robin (Table G-29). Literature data were not adequate to develop ERVs for beryllium, cobalt, HMW PAHs, LMW PAHs, and chloroform. All other ecological COPCs presented in Table G-24 had HQ values less than 1.0 and pose no significant risk to passerines. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that requires a QE.

Lead: HQs for the song sparrow and the robin using the high TRV for lead were below 1.0. The song sparrow and the robin low TRV HQs for lead were 36.9 and 128, which exceeded the background HQs of 3.59 and 12, respectively; however, these HQs may be driven by the overly conservative low TRV value, as described in Section G.2.3.1.2. Using the allometrically converted TRVs, reevaluation of the lead low TRV HQ at Site 11 was calculated as 0.102 for the song sparrow with a background HQ of 0.0099, and an HQ of 0.353 for the robin with a background HQ of 0.0331. Based on this information, lead at Site 11 poses no significant potential for risk to passerines.

Other Metals: The literature data were not adequate to develop avian ERVs for beryllium and cobalt. Beryllium was detected at Site 11 in 27 of 30 samples with concentrations ranging from 0.21 mg/kg to 2 mg/kg, while background concentrations ranged from 0.25 mg/kg to 1.47 mg/kg. Cobalt was detected in all 30 samples collected with concentrations ranging from 2.8 mg/kg to 36.1 mg/kg, while background concentrations ranged from 3.02 mg/kg to 49.7 mg/kg. Based on these background concentrations most of the dose of these metals to passerines would be attributable to background concentrations. Potential risk to passerines from beryllium and cobalt at Site 11 are not expected to be above background concentrations.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 11 at frequencies ranging from 33 to 85 percent out of a total of 60 samples collected. Calculated EPCs ranged from 0.018 mg/kg to 1.23 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987). Given the relatively high frequency of detection, the risk posed to passerines from residual levels of PAHs associated with Site 11 cannot be discounted.

VOCs: The literature data were not adequate to develop an avian ERV for the VOC chloroform. Chloroform was detected in only 1 of 15 samples collected at Site 11, at a concentration of 0.002 mg/kg. The risk posed to passerines from such residual levels of chloroform in soils at Site 11 is postulated to be low because mammals and birds quickly metabolize VOCs.

G.2.3.3.3 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area

Lead was the only ecological COPCs with an HQ above 1.0 using the low TRV value for raptors (Table G-29). Literature data were not adequate to develop ERVs for beryllium, cobalt, HMW PAHs, LMW PAHs, and chloroform. All other ecological COPCs presented in Table G-24 had HQ values less than 1.0 and pose no significant risk to raptors. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that requires a QE.

Lead: The high TRV HQ value for lead for the red-tailed hawk was below 1.0. The low TRV HQ value was 299, which was more than 10 times above the background HQ value of 29. As discussed in Section G.2.3.1.2, however, the Navy believes that this HQ value may be driven by an inappropriately conservative low TRV. When HQs were calculated using the alternate allometrically converted TRV of 0.287, the HQ for lead at Site 11 was 0.822, with a background HQ of 0.0798. Based on this information, lead at Site 11 poses no significant potential for risk to raptors.

Other Metals: The literature data were not adequate to develop avian ERVs for beryllium and cobalt. Beryllium was detected at Site 11 in 27 of 30 samples collected with concentrations ranging from 0.21 mg/kg to 2 mg/kg, while background concentrations ranged from 0.25 mg/kg to 1.47 mg/kg. Cobalt was detected in all 30 samples collected with concentrations ranging from 2.8 mg/kg to 36.1 mg/kg, while background concentrations ranged from 3.02 mg/kg to 49.7 mg/kg. Based on these background concentrations, most of the dose of these metals to raptors would be attributable to background concentrations. Potential risk to raptors from beryllium and cobalt at Site 11 are not expected to be above background concentrations.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 11 at frequencies ranging from 33 to 85 percent out of a total of 60 samples collected. Calculated EPCs ranged from 0.018 mg/kg to 1.23 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987). Given the relatively high frequency of detection, the risk posed to raptors from residual levels of HMW and LMW PAHs associated with Site 11 cannot be discounted.

VOCs: The literature data were not adequate to develop an avian ERV for the VOC chloroform. Chloroform was detected in only 1 of 15 samples collected at Site 11, at a concentration of 0.002 mg/kg. The risk posed to raptors from such residual levels of chloroform in soils at Site 11 is postulated to be low because mammals and birds quickly metabolize VOCs.

G.2.3.3.4 Discussion of Conclusions of the Ecological Risk Assessment for Site 11

Results of the modified ERA for Site 11 indicated potential impacts to mammals from residual levels of copper cannot be discounted. Also, the impact to passerines and raptors from residual levels of PAHs cannot be discounted. However, the risk of exposure to these chemicals for these receptors will be low based on the lack of habitat for these receptor populations at Site 11.

G.2.3.4 Ecological Risk Assessment Results for Site 21

The following sections present the results of the ERA for Site 21 for each of the assessment endpoints evaluated. HQ values for Site 21 are presented in Table G-30.

G.2.3.4.1 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Small Mammal Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using either the high or low TRV value for mammals included aluminum, copper, lead, manganese, vanadium, and zinc (Table G-30). All other ecological COPCs presented in Table G-25 had HQ values of less than 1.0 and pose no significant risk to small mammals. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that requires a QE.

Aluminum: The high TRV HQ value for aluminum was 131, while the low TRV HQ value was 1,310. These values were about 2.2 times above the background high and low HQs of 60 and 600, respectively. Aluminum was detected in all 12 samples collected at Site 21, with concentrations ranging from 3,940 mg/kg to 21,600 mg/kg. Background concentrations ranged from 1,760 mg/kg to 22,600 mg/kg. Based on these ranges of concentrations, aluminum appears to be naturally elevated in soils at Alameda. Aluminum is relatively nontoxic, with most adverse effects caused by inhalation of highly concentrated aluminum dust. Additionally, aluminum does not bioaccumulate in food chains (ATSDR 1999a). Based on this information, aluminum poses no significant potential risk to small mammals at Site 21 above background concentrations.

Copper: The high TRV HQ value for copper was below 1.0. The low TRV HQ value was 2.83, which was more than 3 times the background HQ of 0.722. Copper was detected in all 12 samples collected at Site 21. Concentrations detected at the site ranged from 5.4 to 71.4 mg/kg, while background concentrations ranged from 3.12 mg/kg to 49.1 mg/kg. As discussed in Section G.2.3.1.1, not all of the copper ingested by mammals is absorbed in the GI tract (ATSDR 1990a). An absorption rate of 60 percent is assumed to be conservative, which would revise the low TRV HQ value to 1.68. Based on this information, the potential risk to small mammals from copper at Site 21 cannot be discounted but is expected to be low.

Lead: The high TRV HQ value for lead was below 1.0. The low TRV HQ value was 3.43, which was over 25 times above the background HQ of 0.136. Lead was detected at Site 21 in 10 of 12 samples collected. The concentrations at the site ranged from 2.86 to 416 mg/kg, while background concentrations range from 0.47 to 165 mg/kg. As discussed in Section G.2.3.1.1, GI absorption of lead in soils is limited (ATSDR 1999b). Based on the HQ value, lead at Site 21 poses a potential for risk to small mammals.

Manganese: The high TRV HQ for manganese was below 1.0. The low TRV HQ was 4.67, which was less than 2 times above the background HQ of 2.59. Manganese was detected in all 12 samples collected at Site 21. The concentrations at the site ranged from 91.2 mg/kg to 449 mg/kg, while background concentrations ranged from 55.5 mg/kg to 748 mg/kg. Based on these ranges of concentrations, manganese appears to be naturally elevated in soils at Alameda. Additionally, as discussed in Section G.2.3.1.1, the GI absorption of manganese in animals is limited and affected by dietary intake of essential nutrients, such as calcium and iron (ATSDR 2000). Assuming a conservative absorption rate of 8.2 percent, a revised low TRV HQ value for manganese would be 0.383. Based on this information, manganese at Site 21 poses no significant potential for risk to small mammals.

Vanadium: The high HQ value for vanadium was less than 1.0. The low HQ value was 5.33, which was less than 2 times above the background HQ of 2.73. Vanadium was detected in all 12 samples collected at Site 21. Concentrations at the site ranged from 17.1 mg/kg to 86.7 mg/kg, while background concentrations ranged from 10.5 mg/kg to 55.3 mg/kg. Based on these ranges of concentrations, most of the vanadium dose to small mammals is attributable to background concentrations. Additionally, the GI absorption of vanadium is relatively low, with absorption ranging from 0.1 to 2.6 percent in rats (ATSDR 1992a). Based on this information, vanadium at Site 21 poses no significant potential for risk to small mammals above background concentrations.

Zinc: The high HQ value for zinc was less than 1.0. The low HQ value was 4.17, which was more than 3 times above the background HQ of 1.29. Zinc was detected in all 12 samples collected at Site 21. The concentrations ranged from 16.1 mg/kg to 267 mg/kg, while the background concentrations ranged from 9.98 mg/kg to 191 mg/kg. Based on these ranges of concentrations, most of the zinc dose to small mammals is attributable to background concentrations. Additionally, as discussed in Section G.2.3.1.1, zinc is generally nontoxic in mammals, and not all of the zinc ingested is absorbed in the GI tract (ATSDR 1994a). An absorption rate of 30 percent is assumed to be conservative for small mammal endpoints, which would revise the low TRV HQ value for zinc to 3.06 (ATSDR 1994a). Based on this value, zinc at Site 21 poses a potential for risk to small mammals.

G.2.3.4.2 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Passerine Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using either the high or low TRV values for the Alameda song sparrow and the American robin included aluminum and lead (Table G-30). Literature data were not adequate to develop ERVs for beryllium, cobalt, HMW PAHs, and LMW PAHs. All other ecological COPCs presented in Table G-25 had HQ values less than 1.0 and pose no significant risk to passerines. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that requires a QE.

Aluminum: The high TRV HQ values for aluminum for the song sparrow and robin were below 1.0. The low TRV HQ values were 1.17 and 3.79, which were above the background HQs of 0.536 and 1.71, respectively. Aluminum was detected in all 12 samples collected at Site 21, with concentrations ranging from 3,940 mg/kg to 21,600 mg/kg. Background concentrations ranged from 1,760 mg/kg to 22,600 mg/kg. Based on these ranges of concentrations, aluminum appears to be naturally elevated in soils at Alameda. Aluminum is relatively nontoxic, with most adverse effects caused by inhalation of highly concentrated aluminum dust. Additionally, aluminum does not bioaccumulate in food chains (ATSDR 1999a). Based on this information and the relatively low HQ values, aluminum poses no significant potential risk to passerines at Site 21 above background concentrations.

Lead: HQs for the song sparrow and the robin using the high TRV for lead were below 1.0. The song sparrow and the robin low TRV HQs for lead were 90.6 and 315, which exceeded the background HQs of 3.59 and 12, respectively. These HQs may be driven by the overly conservative low TRV value as described in Section G.2.3.1.2. Using the allometrically converted TRVs, reevaluation of the low TRV HQ at Site 21 was calculated as 0.25 for the song sparrow with a background HQ of 0.0099 and an HQ of 0.867 for the robin with a background HQ of 0.0331. Based on this information, lead at Site 21 poses no significant potential for risk to passerines.

Other Metals: The literature data were not adequate to develop avian ERVs for beryllium and cobalt. Beryllium was detected at Site 21 in 10 of 12 samples collected with concentrations ranging from 0.68 mg/kg to 9.5 mg/kg, while background concentrations ranged from 0.25 mg/kg to 1.47 mg/kg. Cobalt was detected in all 12 samples collected with concentrations ranging from 2.9 mg/kg to 21.1 mg/kg, while background concentrations ranged from 3.02 mg/kg to 49.7 mg/kg. Based on these background concentrations most of the dose of these metals to passerines would be attributable to background concentrations. Potential risk to passerines from beryllium and cobalt at Site 21 are not expected to be above background concentrations.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 21 at frequencies ranging from 11 to 95 percent out of a total of 63 samples collected. Calculated EPCs ranged from 0.005 mg/kg to 0.045 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987). Given the relatively high frequency of detection, the risk posed to passerines from residual levels of HMW and LMW PAHs associated with Site 21 cannot be discounted.

G.2.3.4.3 Sufficient Rates of Survival, Growth, and Reproduction to Sustain Raptor Populations Typical to the Area

Ecological COPCs with HQs above 1.0 using either the high or low TRV values for raptors included aluminum, lead, DDTt, and total PCBs (Table G-30). Literature data were not adequate to develop ERVs for beryllium, cobalt, HMW PAHs, and LMW PAHs. All other ecological COPCs presented in Table G-25 had HQ values less than 1.0 and pose no significant risk to raptors. The following sections discuss each chemical or chemical grouping with an HQ above 1.0 or that requires a QE.

Aluminum: The high TRV HQ value for aluminum for the red-tailed hawk was 2.14 and the low TRV HQ was 19.6. Both of these values exceeded the respective background high and low TRV HQ of 0.981 and 8.96. Aluminum was detected in all 12 samples collected at Site 21, with concentrations ranging from 3,940 mg/kg to 21,600 mg/kg. Background concentrations ranged from 1,760 mg/kg to 22,600 mg/kg. Based on these ranges of concentrations, aluminum appears to be naturally elevated in soils at Alameda. Aluminum is relatively nontoxic, with most adverse effects caused by inhalation of highly concentrated aluminum dust. Additionally, aluminum does not bioaccumulate in food chains (ATSDR 1999a). Based on this information, aluminum poses no significant potential risk to raptors at Site 21 above background concentrations.

Lead: The high HQ value for lead below 1.0. The low HQ value was 732, which was more than 10 times above the background HQ value of 25. As discussed in Section G.2.3.1.2, however, the Navy believes that this HQ value may be driven by an inappropriately conservative low TRV. When HQs were calculated using the alternate allometrically converted TRV of 0.287, the HQ for lead at Site 21 was 2.02, with a background HQ of 0.0798. Based on this information, lead at Site 21 poses a potential for risk to raptors.

Other Metals: The literature data were not adequate to develop avian ERVs for beryllium and cobalt. Beryllium was detected at Site 21 in 10 of 12 samples collected with concentrations ranging from 0.68 mg/kg to 9.5 mg/kg, while background concentrations ranged from 0.25 mg/kg to 1.47 mg/kg. Cobalt was detected in all 12 samples collected with concentrations ranging from 2.9 mg/kg to 21.1 mg/kg, while background concentrations ranged from 3.02 mg/kg to 49.7 mg/kg. Based on these background concentrations most of the dose of these metals to raptors would be attributable to background concentrations. Potential risk to raptors from beryllium and cobalt at Site 21 are not expected to be above background concentrations.

Total PCBs: The high TRV HQ value for total PCBs was below 1.0. The low TRV HQ value was 1.36. Aroclor 1260 was detected in 1 of 10 samples collected at Site 21 at a concentration of 0.14 mg/kg. PCBs are highly persistent compounds that bioconcentrate, bioaccumulate, and biomagnify in the environment (HSDB 1999). PCBs can cause adverse reproductive effects in birds. However, the HQ was calculated conservatively assuming that 100 percent of the organism's diet came from Site 21, which is only 7 acres. Raptors, such as the red-tailed hawk, can have extensive foraging ranges, up to 200 acres. Based on this information and the low HQ value (only slightly above 1.0), the risk to raptors from residual levels of Aroclor 1260 at Site 21 is expected to be low.

Chlorinated Pesticides: The high TRV HQ value for DDTt for the red-tailed hawk was below 1.0. The low TRV HQ value for was 1.23. DDD and DDT were detected in only 1 of 10 samples collected from Site 21 at concentrations of 0.012 and 0.058 mg/kg, respectively. These compounds are insecticides or insecticide breakdown products that bioconcentrate and bioaccumulate in food chains. Reproductive and physiologic effects are seen in mammal and birds from exposure to such compounds (ATSDR 1992c). However, the high HQs associated with these compounds are attributable to the conservative $BCF_{soil\text{-}to\text{-}invert}$ value of 1,202.4, which is based upon the K_{ow} value of 5.16. Based on the low frequency of detection and the low HQ value (only slightly above 1.0), the risk to raptors from residual levels of DDD and DDT at Site 21 is expected to be low.

PAHs: The literature data were not adequate to develop avian ERVs for PAHs. The HMW and LMW PAHs were detected at Site 21 at frequencies ranging from 11 to 95 percent out of a total of 63 samples collected. Calculated EPCs ranged from 0.005 mg/kg to 0.045 mg/kg. PAHs can cause genotoxic, reproductive, and mutagenic effects; however, studies indicate that PAH compounds do not appear to bioaccumulate in mammals and birds (Eisler 1987). Given the relatively high frequency of detection, the risk posed to raptors from residual levels of HMW and LMW PAHs associated with Site 21 cannot be discounted.

G.2.3.4.5 Discussion of Conclusions of the Ecological Risk Assessment for Site 21

Results of the modified ERA for Site 21 indicated potential risk to small mammals from lead and zinc as well as a risk to raptors from lead. The impact to passerines and raptors from residual levels of PAHs cannot be discounted. Also, the impact to mammals from residual levels of copper cannot be discounted. However, the risk of exposure to these chemicals will be low based on the lack of habitat for these receptor populations at Site 21.

G.2.4 RESULTS OF THE ECOLOGICAL RISK ASSESSMENT FOR MARINE RECEPTORS

The following sections contain the results of the modified ERA for groundwater at OU-2B sites for marine receptors. Retained ecological COPCs evaluated are presented in Table G-26.

G.2.4.1 Results of the Screening-level Ecological Risk Assessment for Surface Water (Marine Receptors)

Chemicals detected in groundwater collected from OU-2B that were retained as ecological COPCs included the metals aluminum, barium, chromium, cobalt, manganese, molybdenum, nickel, and vanadium; and the VOCs 1,2,4-trichloromethylbenzene, acetone, carbon disulfide, isopropylbenzene, tert-butanol, TCE, vinyl chloride, and xylene (see Table G-26). HQs for chromium, nickel and TCE were calculated by dividing their EPCs by 10, as a dilution factor, and then dividing the result by the relevant saltwater screening criterion. The HQ value for chromium was 0.226, the HQ value for nickel was 0.374, and the HQ value for TCE was 0.393 (see Table G-26). Based on these HQ values these chemicals pose no significant potential risk to marine receptors in the Seaplane Lagoon. The other retained chemicals did not have published saltwater screening values. Impacts of these chemicals to marine receptors are qualitatively assessed in the following paragraphs.

Aluminum: Aluminum is a naturally occurring element in surface waters; however, aluminum is very reactive and rarely is found as a free metal in nature. Generally, it is combined with other elements such as silicon and oxygen (ATSDR 1999a). Studies have shown that approximately 0.002 mg/L of dissolved aluminum occurs in seawater (National Library of Medicine 2003). Aluminum was detected in 37 of 70 samples collected in the groundwater at OU-2B, at concentrations ranging from 0.0056 mg/L to 2.24 mg/L. Background groundwater concentrations of aluminum at Alameda Point ranged from 0.003 mg/L to 4.53 mg/L (Table G-19). Based on background concentrations, the aluminum detected in groundwater at OU-2B appears to be consistent with background conditions.

Barium: Barium is a naturally occurring element in surface waters. In an aquatic environment, barium most likely will precipitate out of solution as a barium sulfate or barium carbonate or the barium ion will adsorb to particulate matter. Barium can bioaccumulate in terrestrial and aquatic organisms and marine plants can bioconcentrate barium by a factor of 1,000 times the concentration found in water. Marine animals, plankton, and brown algae have reported BCFs of 100, 120, and 260, respectively (ATSDR 1990b). Barium was detected in 64 of 70 samples collected in the groundwater at OU-2B, with concentrations ranging from 0.00002 mg/L to 0.00011 mg/L. Background concentrations of barium at Alameda Point ranged from 0.0023 mg/L to 1.26 mg/L (Table G-19). Based on background concentrations, the barium detected in groundwater at OU-2B appears to be consistent with background conditions.

Cobalt: Most of the cobalt emitted into the environment settles into the soil or sediment. Mollusks, crustaceans, and other bottom feeders have been reported to accumulate large quantities of cobalt (Jenkins 1980). A study of organisms in Ottawa River sediments, however, showed no detectable bioaccumulation of cobalt-60 (Evans and others 1988). BCFs for cobalt on a DW basis were 100 to 4,000 for marine fish (Smith and Carson 1981). Cobalt was detected in 60 of 70 samples collected in the groundwater at OU-2B, with concentrations ranging from 0.00006 mg/L to 0.041 mg/L. The reporting limits for this compound were 0.00021 mg/L to 0.01 mg/L. Background groundwater concentrations of cobalt at Alameda Point ranged from 0.0008 mg/L to 0.0105 mg/L (Table G-19). Applying a dilution factor of 10 to the maximum concentration detected in groundwater results in a concentration of 0.0041 mg/L at the discharge point in the Seaplane Lagoon (NOAA 1999). Two freshwater criteria were identified for cobalt and were: (1) the Oak Ridge National Laboratory (ORNL) Tier II Benchmarks for Priority Pollutants of 0.023 mg/L (Suter and Tsao 1996), and (2) the EPA Chronic Freshwater value of 0.003 mg/L. Even though a large uncertainty exists when comparing freshwater criteria with marine environments, these values serve as a comparison. Based on the freshwater criterion and the background concentrations, the cobalt detected in groundwater at OU-2B is not expected to pose a significant risk to marine receptors.

Manganese: Manganese occurs naturally in rock and in soils and sediments weathered by rock. Dissolution of manganese from rocks and soils into groundwater and surface water causes natural concentrations of manganese in aquatic systems. These natural concentrations have been determined to range from 0.01 to 1.7 mg/L (Riemer 1999). Manganese is an essential nutrient in aquatic species (Alken-Murray Corporation 2003). Manganese was detected in 68 of 70 samples collected in the groundwater at OU-2B, with concentrations ranging from 0.00082 to 26 mg/L. Background groundwater concentrations of manganese at Alameda Point ranged from 0.0011 to 2.48 mg/L (Table G-19). Applying a dilution factor of 10 to the maximum concentration detected in groundwater results in a potential surface water concentration of 2.6 mg/L of cobalt at the discharge point in the Seaplane Lagoon (NOAA 1999). The only water criterion identified in the literature for manganese was the freshwater ORNL Tier II value of 0.12 mg/L (Suter and Tsao 1996). Based on this information, the manganese detected in groundwater at OU-2B may present a risk to marine receptors; however, this risk is expected to be low.

Molybdenum: Molybdenum is an essential nutrient to all terrestrial, freshwater, and marine organisms, which assists in the metabolism of carbon, nitrogen, and sulfur compounds. Molybdenum is the most abundant metal in oceans because it becomes soluble when exposed to oxygen. In anoxic conditions, molybdenum would be less available (National Aeronautics and Space Administration Astrobiology Institute 2003). Molybdenum was detected in 53 of 70 samples collected in the groundwater at OU-2B, with concentrations in groundwater ranging from 0.00074 mg/L to 0.39 mg/L. Background groundwater concentrations of molybdenum at Alameda Point ranged from 0.0005 mg/L to 0.0194 mg/L (Table G-19). Applying a dilution factor of 10 to the maximum concentration detected in groundwater results in a concentration of 0.039 mg/L of molybdenum potentially reaching the Seaplane Lagoon (NOAA 1999). Two freshwater criteria were identified for molybdenum: the ORNL Tier II value of 0.37 mg/L (Suter and Tsao 1996) and the EPA ecotoxicity threshold value of 0.24 mg/L. Based on the freshwater criteria, the molybdenum detected in groundwater at OU-2B is not expected to present a risk to marine receptors.

Vanadium: Metallic vanadium does not occur in nature. Production of vanadium is linked with that of other metals such as iron, uranium, titanium, and aluminum. Vanadium can be extracted from fossil fuels as well. Vanadium and its compounds are considered toxic, although this toxicity is variable. Toxicity depends on the valence; it increases with increasing valence, with pentavalent vanadium being the most toxic. Vanadium is recognized as an essential element for certain species of algae; however, studies have not verified whether vanadium is essential to higher plants and animals (Irwin 1997). Vanadium was detected in 43 of 70 samples collected in the groundwater at OU-2B, with concentrations ranging from 0.00072 mg/L to 0.046 mg/L. Background groundwater concentrations of vanadium at Alameda Point ranged from 0.002 to 0.0508 mg/L (Table G-19). Based on background concentrations, the vanadium detected in groundwater at OU-2B appears to be consistent with background conditions

VOCs: The VOCs 1,2,4-trichloromethylbenzene, acetone, carbon disulfide, isopropylbenzene, tert-butanol, vinyl chloride, and xylene were detected in the groundwater at OU-2B in 5.5 to 24 percent of the samples collected.

1,2,4-trichloromethylbenzene was detected in 8 of 128 samples collected at concentrations ranging from 0.0002 mg/L and 0.046 mg/L. A screening benchmark criterion has not been developed for this compound. Applying a dilution factor of 10 to the maximum concentration detected in the groundwater results in a concentration of 0.0046 mg/L potentially reaching the Seaplane Lagoon (NOAA 1999). Based on this information, and the relatively low toxicity and low persistence of VOCs in aquatic, aerobic environments, this chemical poses a low potential for risk to marine receptors.

Acetone was detected in 22 of 231 samples collected at concentrations ranging from 0.0005 mg/L to 63 mg/L and a calculated EPC of 1.54 mg/L. The only water criterion identified in the literature for acetone was the freshwater ORNL Tier II value of 1.5 mg/L (Suter and Tsao 1996). A review of the detected data for acetone indicated that only three samples exceeded a value of 1 mg/L, these sample concentrations were 1.6 mg/L, 10 mg/L, and 63 mg/L. Applying a dilution factor of 10 to the EPC for acetone results in a concentration of 0.154 mg/L potentially reaching the Seaplane Lagoon (NOAA 1999). Based on these factors and the relatively low toxicity and low persistence of VOCs in aquatic, aerobic environments, this chemical poses a low potential for risk to marine receptors.

Carbon disulfide was detected in 42 of 237 samples collected at concentrations ranging from 0.002 mg/L to 0.017 mg/L. The freshwater ORNL Tier II value for carbon disulfide was

0.00092 mg/L. Applying a dilution factor of 10 to the maximum concentration detected in the groundwater results in a concentration of 0.0017 mg/L potentially reaching the Seaplane Lagoon (NOAA 1999). Based on the low persistence of VOCs in aquatic, aerobic environments, this chemical poses a low potential for risk to marine receptors.

Isopropylbenzene was detected in 6 of 109 samples collected at concentrations ranging from 0.0005 mg/L to 0.0055 mg/L. A screening benchmark criterion has not been developed for this compound. Applying a dilution factor of 10 to the maximum concentration detected in the groundwater results in a concentration of 0.00055 mg/L potentially reaching the Seaplane Lagoon (NOAA 1999). Based on the low frequency of detection (5.5 percent), low concentrations detected, and the relatively low toxicity and low persistence of VOCs in aquatic, aerobic environments, this chemical poses a low potential for risk to marine receptors.

Tert-butanol was detected in 12 of 73 samples collected at concentrations ranging from 0.0027 mg/L to 0.5 mg/L. A screening benchmark criterion has not been developed for this compound. Applying a dilution factor of 10 to the maximum concentration detected in the groundwater results in a concentration of 0.05 mg/L potentially reaching the Seaplane Lagoon (NOAA 1999). Based on this information, and the relatively low toxicity and low persistence of VOCs in aquatic, aerobic environments, this chemical poses a low potential for risk to marine receptors.

Vinyl chloride was detected in 62 of 256 samples collected with concentrations ranging from 0.0003 mg/L to 1.4 mg/L and an EPC of 0.0335 mg/L. The U.S. Department of Energy freshwater chronic preliminary remediation goal for vinyl chloride was established at 0.782 mg/L. Applying a dilution factor of 10 to the maximum concentration detected in the groundwater results in a concentration of 0.14 mg/L potentially reaching the Seaplane Lagoon (NOAA 1999). Based on the low persistence of VOCs in aquatic, aerobic environments and the comparison to the available aquatic criteria, this chemical poses a low potential for risk to marine receptors.

Xylene was detected in 23 of 128 samples collected at concentrations ranging from 0.0003 mg/L to 0.32 mg/L and an EPC of 0.0186 mg/L. The freshwater ORNL benchmark for xylene was 0.013 mg/L. Applying a dilution factor of 10 to the EPC concentration in the groundwater results in a concentration of 0.00186 mg/L potentially reaching the Seaplane Lagoon (NOAA 1999). Based on the low persistence of VOCs in aquatic, aerobic environments and the expected low concentration reaching Seaplane Lagoon, this chemical poses a low potential for risk to marine receptors.

TABLE G-22: SITE 3 SURFACE SOIL DETECTED CONSTITUENT SCREENING-- SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
Metals (mg/kg)							
Aluminum[b]	14/14	NA	3,820	22,400	11,790.93		X
Antimony[c]	2/14	0.46 - 9.9	0.92	1	1	CSB	
Arsenic[b]	8/14	0.52 - 16	1.2	21	21		X
Barium[d]	14/14	NA	17.3	1,060	220.9		X
Beryllium[c]	6/14	0.2 - 1.6	0.31	1.9	1.46	CSB	
Cadmium[c]	4/14	0.06 - 1.6	0.07	1.3	1.08	CSB	
Calcium[d]	14/14	NA	2,000	20,000	7,825.31	EN	
Chromium[e]	13/14	0.08 - 8.2	22	79	42.61	CSB	
Cobalt[b]	10/14	1.3 - 8.2	4.4	11.1	11.1		X
Copper[b]	13/14	0.4 - 8.2	4.9	119	54.64		X
Iron[b]	14/14	NA	7,050	34,300	21,613.24	EN	
Lead[b]	37/42	0.17 - 8.2	1.7	3,870	634.15		X
Magnesium[b]	14/14	NA	1,830	10,000	4,544.69	EN	
Manganese[b]	14/14	NA	76.1	887	294.47		X
Mercury[c]	1/8	0.15 - 0.24	0.82	0.82	0.6	CSB	
Nickel[f]	13/14	1.9 - 8.2	20	66	39.02	CSB	
Potassium[b]	14/14	NA	213	4,100	1,826.35	EN	
Silver[c]	1/14	0.18 - 8.2	2.4	2.4	2.4	CSB	
Sodium[c]	6/14	2.3 - 820	434	6,400	3,000.46	EN	
Titanium[b]	6/6	5.4 - 8.2	310	670	538.29	CSB	
Vanadium[b]	14/14	NA	16	69.3	40.14		X
Zinc[d]	14/14	NA	18	1,260	231.35		X
SVOCs (mg/kg)							
2-Methylnaphthalene[d]	102/156	0.00022-0.0189	0.00022	0.37	0.015		X
Acenaphthene[c]	77/156	0.00022-0.0284	0.00028	2.6	0.103		X
Acenaphthylene[d]	100/153	0.00017-0.0307	0.00023	0.048	0.016		X
Anthracene[d]	115/156	0.0002-0.026	0.00021	7.6	1.05		X
Benzo(a)anthracene[b]	137/156	0.00014-0.0426	0.00020	14	0.151		X
Benzo(a)pyrene[b]	142/156	0.00015-0.0331	0.00028	11	0.259		X
Benzo(b)fluoranthene[b]	142/156	0.00015-0.0307	0.00031	11	0.201		X
Benzo(g,h,i)perylene[b]	147/156	0.00011-0.0355	0.00030	4.1	0.231		X
Benzo(k)fluoranthene[b]	123/156	0.00016-0.0426	0.00024	10	0.337		X
Chrysene[b]	139/156	0.00016-0.0402	0.00025	14	0.211		X
Dibenz(a,h)anthracene[d]	108/156	0.00019-0.0331	0.00033	1	0.044		X
Fluoranthene[d]	134/156	0.00018-0.0449	0.00050	38	0.39		X
Fluorene[d]	93/155	0.00018-0.024	0.00019	3.9	0.025		X
Indeno(1,2,3-cd)pyrene[b]	131/156	0.00016-0.0473	0.00034	5.9	0.474		X
Naphthalene[d]	122/156	0.00022-0.024	0.00026	1.8	0.024		X
Phenanthrene[d]	130/156	0.00016-0.0402	0.00034	32	0.276		X
Pyrene[d]	142/156	0.00012-0.0378	0.00093	25	0.394		X
VOCs (mg/kg)							
2-Butanone[c]	1/13	0.01 - 13	0.24	0.24	0.24		X
Acetone[c]	2/13	0.01 - 13	0.14	0.58	0.58		X
Benzene[c]	1/13	0.005 - 13	7.5	7.5	3.19		X
Carbon disulfide[c]	1/13	0.005 - 13	0.01	0.01	0.01		X
Ethylbenzene[c]	2/13	0.005 - 13	0.94	50	20.66		X
Toluene[c]	6/13	0.005 - 13	0.002	210	86.59		X
Xylene (Total)[c]	2/13	0.005 - 13	2.3	250	103.18		X

TABLE G-22: SITE 3 SURFACE SOIL DETECTED CONSTITUENT SCREENING-- SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes:

a	The EPC is the lesser of the UCL95 and the maximum detected concentration. The maximum detected concentration is used for all samples with fewer than three detected measurements.
b	Distribution determined to be lognormal.
c	Distribution not tested.
d	Distribution determined to be unknown, but assumed to be lognormal based on examination of probability plots and outlier box plots.
e	Distribution determined to be unknown, but assumed to be normal based on examination of probability plots and outlier box plots.
f	Distribution determined to be normal.

CSB	Concentrations within statistical background
EN	Essential nutrient
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
NA	Not applicable, frequency of detection is 100 percent
SVOC	Semivolatile organic chemical
UCL95	95th percentile upper confidence limit on the arithmetic mean
VOC	Volatile organic chemical

TABLE G-23: SITE 4 SURFACE SOIL DETECTED CONSTITUENT SCREENING-- SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
Metals (mg/kg)							
Aluminum[b]	68/68	NA	2,870	10,000	5,621.34	CSB	
Antimony[c]	12/66	0.42-9.00	0.46	134	12.27		X
Arsenic[d]	43/68	0.26-13.00	0.94	7.4	4.53		X
Barium[d]	68/68	NA	23	317	59.66		X
Beryllium[c]	29/68	0.08-1.30	0.17	1.5	0.48	CSB	
Cadmium[c]	37/79	0.02-1.30	0.1	105	9.58		X
Calcium[d]	68/68	NA	1,000	16,100	4,773.05	EN	
Chromium[d]	76/77	0.01-6.40	19.8	1,530	88.29		X
Chromium (VI)[b]	25/29	0.03-0.28	0.09	7.81	2.48		X
Cobalt[d]	56/68	0.41-6.40	1.90	26.3	9.94	CSB	
Copper[d]	70/71	0.08-6.40	4.30	326	24.26		X
Iron[e]	68/68	NA	103	14,600	9,249.67	EN	
Lead[d]	60/71	0.14-6.40	1.6	1,460	54.99		X
Magnesium[b]	68/68	NA	1,240	4,200	2,522.5	EN	
Manganese[d]	68/68	NA	72	306	141.88		X
Mercury[c]	14/50	0.05-0.18	0.05	0.24	0.12		X
Molybdenum[c]	5/48	0.42-6.40	0.72	3.1	2.24		X
Nickel[d]	71/71	NA	17	1,400	64.8		X
Potassium[b]	61/68	37.20-640.00	386	1,200	792.24	EN	
Selenium[c]	3/68	0.21-13.00	0.44	1.2	1.2	FOD	
Silver[c]	30/71	0.06-6.40	0.8	81.1	11.55		X
Sodium[b]	60/68	2.30-640.00	83.3	1,530	403.74	EN	
Titanium[b]	18/18	NA	197	729	444.32	CSB	
Vanadium[b]	68/68	NA	13	35	22.11		X
Zinc[d]	68/68	NA	13.6	283	38.32		X
SVOCs (mg/kg)							
2-Methylnaphthalene[d]	117/225	0.00022-0.0189	0.00022	0.3	0.014		X
Acenaphthene[c]	63/225	0.00022-0.0284	0.00023	0.29	0.019		X
Acenaphthylene[d]	111/222	0.00017-0.0307	0.00019	0.28	0.021		X
Anthracene[d]	129/225	0.0002-0.026	0.00021	0.74	0.025		X
Benzo(a)anthracene[d]	182/225	0.00014-0.0426	0.00015	1.6	0.122		X
Benzo(a)pyrene[d]	186/223	0.00015-0.0331	0.00023	2.1	0.141		X
Benzo(b)fluoranthene[d]	187/225	0.00015-0.0307	0.00023	1.9	0.142		X
Benzo(g,h,i)perylene[b]	201/223	0.00011-0.0355	0.00028	1.8	0.071		X
Benzo(k)fluoranthene[d]	164/225	0.00016-0.0426	0.00017	1.1	0.083		X
Bis(2-ethylhexyl)phthalate[c]	2/95	0.035-3.8	0.69	7.6	1.311		X
Chrysene[d]	190/224	0.00016-0.0402	0.00024	2.2	0.201		X
Dibenz(a,h)anthracene[d]	121/225	0.00019-0.0331	0.00021	0.18	0.027		X
Fluoranthene[d]	186/220	0.00018-0.0449	0.00022	3.9	0.189		X
Fluorene[c]	80/221	0.00018-0.024	0.00019	0.45	0.023		X
Indeno(1,2,3-cd)pyrene[d]	173/216	0.00016-0.0473	0.00029	1.7	0.108		X
n-Nitroso-di-n-propylamine[c]	2/95	0.11-3.8	0.064	0.18	0.180	FOD-NB	
n-Nitroso-diphenylamine[c]	3/95	0.086-3.8	0.073	0.32	0.320		X
Naphthalene[d]	118/225	0.00022-0.024	0.00026	0.32	0.017		X
Pentachlorophenol[c]	1/95	0.54-19	0.13	0.13	0.130		X
Phenanthrene[d]	180/225	0.00016-0.0402	0.00022	4.1	0.094		X

TABLE G-23: SITE 4 SURFACE SOIL DETECTED CONSTITUENT SCREENING-- SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
SVOCs (Continued) (mg/kg)							
Phenol[c]	1/95	0.15-3.8	0.074	0.074	0.074	FOD-NB	
Pyrene[b]	194/225	0.00012-0.0378	0.0002	4.2	0.122		X
VOCs (mg/kg)							
1,1,1-Trichloroethane[c]	5/62	0.005-0.013	0.002	0.008	0.008		X
1,1-Dichlorethene[c]	2/62	0.005-0.013	0.001	0.004	0.004	FOD-NB	
1,2-Dichloroethene (Total)[c]	1/62	0.005-0.013	0.001	0.001	0.001	FOD-NB	
Acetone[c]	1/62	0.01-0.018	0.092	0.092	0.019	FOD-NB	
Carbon disulfide[c]	3/61	0.005-0.013	0.001	0.001	0.001	FOD-NB	
Ethylbenzene[c]	21/61	0.005-0.013	0.001	0.028	0.009		X
Methylene Chloride[c]	1/62	0.005-0.013	0.005	0.005	0.005	FOD-NB	
Toluene[c]	15/62	0.005-0.013	0.001	0.19	0.037		X
Trichloroethene[c]	1/62	0.005-0.013	0.059	0.059	0.011	FOD-NB	
Xylene (Total)[c]	30/61	0.005-0.013	0.001	0.17	0.036		X

Notes:

a	The EPC is the lesser of the UCL95 and the maximum detected concentration. The maximum detected concentration is used for all samples with fewer than three detected measurements.
b	Distribution determined to be lognormal.
c	Distribution not tested.
d	Distribution determined to be unknown, but assumed to be lognormal based on examination of probability plots and outlier box plots.
e	Distribution determined to be unknown, but assumed to be normal based on examination of probability plots and outlier box plots.

CSB	Concentrations within statistical background
EN	Essential nutrient
EPC	Exposure point concentration
FOD	Frequency of detection five percent or lower
mg/kg	Milligram per kilogram
NA	Not applicable, frequency of detection is 100 percent
NB	Non-bioaccumulating
SVOC	Semivolatile organic chemical
UCL95	95th percentile upper confidence limit on the arithmetic mean
VOC	Volatile organic chemical

TABLE G-24: SITE 11 SURFACE SOIL DETECTED CONSTITUENT SCREENING-- SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
Metals (mg/kg)							
Aluminum[b]	30/30	NA	3,150	25,900	8,494.57	CSB	
Antimony[c]	3/30	0.45-2.70	0.61	2.6	1.73	CSB	
Arsenic[b]	29/30	0.24-0.53	0.53	4.2	2.36	CSB	
Barium[b]	30/30	NA	10.3	73.4	43.83	CSB	
Beryllium[d]	27/30	0.13-0.23	0.21	2	1.01		X
Cadmium[c]	11/30	0.08-0.32	0.12	4.32	1.56	CSB	
Calcium[b]	30/30	NA	1,380	28,700	6,499.11	EN	
Chromium[e]	29/30	0.08-0.61	5.3	44.7	28.98	CSB	
Cobalt[b]	30/30	NA	2.8	36.1	9.58		X
Copper[b]	28/30	0.00-0.80	4.77	83.2	28.72		X
Iron[b]	30/30	NA	6,430	32,200	14,520.95	EN	
Lead[b]	27/30	0.20-3.70	0.78	242	102.8		X
Magnesium[b]	30/30	NA	1,840	15,100	4,814.09	EN	
Manganese[b]	30/30	NA	60.6	558	254.38		X
Mercury[c]	4/30	0.08-0.25	0.12	0.63	0.23	CSB	
Nickel[d]	28/30	1.32-3.30	6.75	51.2	27.82	CSB	
Potassium[b]	28/30	57.10-140.00	176	1,220	719.92	EN	
Selenium[c]	1/30	0.19-0.60	0.28	0.28	0.28	FOD	
Silver[c]	3/30	0.18-0.53	0.65	0.82	0.63	CSB	
Sodium[f]	29/30	5.00-6.40	80.3	1,020	399.73	EN	
Vanadium[b]	30/30	NA	14.5	82.5	32		X
Zinc[f]	30/30	NA	16.1	196	47.34		X
SVOCs (mg/kg)							
2-Methylnaphthalene[c]	29/60	0.00022-0.0189	0.00028	0.061	0.019		X
Acenaphthene[c]	23/60	0.00022-0.0284	0.0003	0.42	0.05		X
Acenaphthylene[c]	20/60	0.00017-0.0307	0.00018	0.068	0.018		X
Anthracene[f]	33/60	0.0002-0.026	0.00025	1.6	0.121		X
Benzo(a)anthracene[b]	47/60	0.00014-0.0426	0.00033	11	0.601		X
Benzo(a)pyrene[f]	49/60	0.00015-0.0331	0.00035	4.7	0.414		X
Benzo(b)fluoranthene[b]	50/60	0.00015-0.0307	0.00026	9.2	0.597		X
Benzo(g,h,i)perylene[b]	50/60	0.00011-0.0355	0.00055	1.8	0.217		X
Benzo(k)fluoranthene[b]	46/60	0.00016-0.0426	0.00018	2.3	0.277		X
Chrysene[b]	50/60	0.00016-0.0402	0.00036	9.9	0.694		X
Dibenz(a,h)anthracene[f]	33/60	0.00019-0.0331	0.00022	0.7	0.056		X
Fluoranthene[b]	51/60	0.00018-0.0449	0.00026	15	0.933		X
Fluorene[c]	22/60	0.00018-0.024	0.00032	0.43	0.052		X
Indeno(1,2,3-cd)pyrene[f]	41/60	0.00016-0.0473	0.00082	1.5	0.208		X
Naphthalene[f]	36/60	0.00022-0.024	0.00022	0.05	0.024		X
Phenanthrene[f]	46/60	0.00016-0.0402	0.00028	8.2	0.625		X
Pyrene[f]	49/60	0.00012-0.0378	0.00056	12	1.23		X
VOCs (mg/kg)							
Chloroform[a]	1/15	0.0052-0.011	0.002	0.002	0.002		X

Notes:

a The EPC is the lesser of the UCL95 and the maximum detected concentration. The maximum detected concentration is used for all samples with fewer than three detected measurements.

b Distribution determined to be lognormal.

c Distribution not tested.

TABLE G-24: SITE 11 SURFACE SOIL DETECTED CONSTITUENT SCREENING– SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes (Continued):

d	Distribution determined to be normal.
e	Distribution determined to be unknown, but assumed to be normal based on examination of probability plots and outlier box plots.
f	Distribution determined to be unknown, but assumed to be lognormal based on examination of probability plots and outlier box plots.
CSB	Concentrations within statistical background
EN	Essential nutrient
EPC	Exposure point concentration
FOD	Frequency of detection five percent or lower
mg/kg	Milligram per kilogram
NA	Not applicable, frequency of detection is 100 percent
SVOC	Semivolatile organic chemical
UCL95	95th percentile upper confidence limit on the arithmetic mean
VOC	Volatile organic chemical

TABLE G-25: SITE 21 SURFACE SOIL DETECTED CONSTITUENT SCREENING– SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	EPC[a]	Screening Evaluation	
						Rejected	Retained
Metals (mg/kg)							
Aluminum[b]	12/12	NA	3,940	21,600	14,250.97		X
Antimony[c]	3/12	0.46-2.70	2.9	4.7	3.41	CSB	
Arsenic[b]	10/12	0.26-0.54	2.25	6.66	6.66		X
Barium[b]	12/12	NA	35.7	144	86.77		X
Beryllium[d]	10/12	0.13-0.23	0.87	2.5	1.61		X
Cadmium[c]	4/12	0.08-0.33	0.68	9.5	4.76	CSB	
Calcium[b]	12/12	NA	3,920	17,300	8,901.6	EN	
Chromium[b]	12/12	NA	16	67	44.98	CSB	
Cobalt[b]	12/12	NA	2.9	21.1	13.91		X
Copper[b]	12/12	NA	5.4	71.4	41.27		X
Iron[b]	12/12	NA	7,280	34,100	21,016.92	EN	
Lead[b]	10/12	0.20-3.53	2.86	416	252.16		X
Magnesium[b]	12/12	NA	1,930	11,300	7,338.56	EN	
Manganese[d]	12/12	NA	91.2	449	300.91		X
Mercury[c]	3/12	0.15-0.27	0.16	2.6	1.27	CSB	
Nickel[b]	12/12	NA	19.7	80.4	46.37	CSB	
Potassium[b]	11/12	55.70-140.00	461	2,080	1,170.82	EN	
Silver[c]	3/12	0.18-0.54	0.61	5.64	2.83	CSB	
Sodium[b]	12/12	NA	88.2	849	559.1	EN	
Vanadium[b]	12/12	NA	17.1	86.7	47.92		X
Zinc[b]	12/12	NA	16.1	267	94.47		X
Pesticides (mg/kg)							
4,4'-DDD[c]	1/10	0.0033-0.018	0.012	0.012	0.009		X
4,4'-DDT[c]	1/10	0.0033-0.018	0.058	0.058	0.033		X
Aroclor 1260[c]	1/10	0.033-0.18	0.14	0.14	0.088		X
SVOCs (mg/kg)							
2-Methylnaphthalene[e]	39/63	0.00022-0.0189	0.00024	0.063	0.007		X
Acenaphthene[c]	7/63	0.00022-0.0284	0.00036	0.01	0.01		X
Acenaphthylene[c]	14/63	0.00017-0.0307	0.00019	0.0048	0.005		X
Anthracene[c]	26/63	0.0002-0.026	0.00022	0.019	0.011		X
Benzo(a)anthracene[b]	50/63	0.00014-0.0426	0.0002	0.084	0.02		X
Benzo(a)pyrene[b]	49/63	0.00015-0.0331	0.00041	0.087	0.028		X
Benzo(b)fluoranthene[b]	54/63	0.00015-0.0307	0.00031	0.085	0.018		X
Benzo(g,h,i)perylene[b]	53/63	0.00011-0.0355	0.00031	0.13	0.042		X
Benzo(k)fluoranthene[e]	43/63	0.00016-0.0426	0.0003	0.073	0.02		X
Chrysene[b]	52/63	0.00016-0.0402	0.00017	0.27	0.045		X
Dibenz(a,h)anthracene	27/63	0.00019-0.0331	0.00029	0.028	0.013		X
Fluoranthene[b]	60/63	0.00018-0.0449	0.00025	0.099	0.016		X
Fluorene[c]	10/63	0.00018-0.024	0.00022	0.077	0.014		X
Indeno(1,2,3-cd)pyrene[b]	45/63	0.00016-0.0473	0.00021	0.13	0.028		X
Naphthalene[e]	32/63	0.00022-0.024	0.00029	0.032	0.007		X
Phenanthrene[e]	53/63	0.00016-0.0402	0.00026	0.16	0.012		X
Pyrene[b]	56/63	0.00012-0.0378	0.00034	0.14	0.021		X

Notes:

a The EPC is the lesser of the UCL95 and the maximum detected concentration. The maximum detected concentration is used for all samples with fewer than three detected measurements.

b Distribution determined to be lognormal.

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

TABLE G-25: SITE 21 SURFACE SOIL DETECTED CONSTITUENT SCREENING-- SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Notes (Continued):

c	Distribution not tested.
d	Distribution determined to be normal.
e	Distribution determined to be unknown, but assumed to be lognormal based on examination of probability plots and outlier box plots.
CSB	Concentrations within statistical background
DDD	Dichlorodiphenyldichloroethane
DDT	Dichlorodiphenyltrichloroethane
EN	Essential nutrient
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
NA	Not applicable, frequency of detection is 100 percent
SVOC	Semivolatile organic chemical
UCL95	95th percentile upper confidence limit on the arithmetic mean

TABLE G-26: OU-2B GROUNDWATER DETECTED CONSTITUENT SCREENING -- SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Chemical	SCREENING LEVELS MARINE[a]		Frequency of Detection	Reporting Limit	Minimum Concentration	Maximum Concentration	EPC[c]	Screening Evaluation		Hazard Quotient
	CCC	CMC[b]						Rejected	Retained	
Metals (mg/L)										
Aluminum	**	**	37/70	0.0046 - 1	0.0056	2.24	0.31		X	NA
Antimony	0.5[d]	NA	42/70	0.00008 - 0.05	0.00004	0.0014	0.00072	CSL		NA
Arsenic	0.036	NA	54/70	0.0008 - 0.005	0.0012	0.083	0.015	CSL		NA
Barium	**	**	64/70	0.00005 - 0.307	0.024	0.88	0.18		X	NA
Beryllium	**	**	8/70	0.0001 - 0.002	0.00002	0.00011	0.00011	CSB		NA
Cadmium	0.0093	NA	17/78	0.00007 - 0.005	0.00005	0.0034	0.00288	CSL		NA
Calcium	**	**	70/70	0.0038 - 50	3.8	1,400	347	EN		NA
Chromium	0.05[e]	NA	35/77	0.00013 - 0.01	0.0001	1.54	0.113		X	**0.226**
Chromium (VI)	0.05		1/7	0.01	0.19	0.19	0.147	CSB		NA
Cobalt	**	**	60/70	0.00021 - 0.01	0.00006	0.041	0.00553		X	NA
Copper	0.0031	NA	61/70	0.0006 - 0.01	0.00007	0.02	0.00537	CDL		NA
Iron	**	**	58/70	0.0083 - 0.5	0.0242	28	12.3	EN		NA
Lead	0.0081	NA	21/88	0.00002 - 0.003	0.00004	0.058	0.00569	CDL		NA
Magnesium	**	**	69/70	0.0038 - 50	2	2,600	682	EN		NA
Manganese	**	**	68/70	0.0002 - 1	0.00082	26	26		X	NA
Mercury	0.00094[d,f]	NA	4/70	0.00004 - 0.00027	0.00004	0.00005	0.00005	CSB		NA
Molybdenum	**	**	53/70	0.00025 - 0.2	0.00074	0.39	0.0234		X	NA
Nickel	0.0082	NA	60/70	0.0003 - 0.1	0.00042	0.52	0.0266		X	**0.324**
Potassium	**	**	70/70	0.0037 - 5	0.91	370	56	EN		NA
Selenium	0.071	NA	47/69	0.0008 - 0.005	0.00036	0.078	0.00967	CDL		NA
Silver	NV	0.00019	2/70	0.00003 - 0.005	0.00074	0.0017	0.0017	FOD		NA
Sodium	**	**	70/70	0.0885 - 50	13	17,000	5,350	EN		NA
Thallium	0.04	NA	5/70	0.00001 - 0.0039	0.00025	0.006	0.00137	CSL		NA
Vanadium	**	**	43/70	0.00024 - 0.01	0.00072	0.046	0.0073		X	NA
Zinc	0.081	NA	36/70	0.0003 - 0.0979	0.00049	0.106	0.0138	CDL		NA
SVOCs (mg/L)										
Acenaphthylene	**	0.030[d,g]	1/110	0.002 - 0.01	0.002	0.002	0.002	CSL		NA
Benzo(a)anthracene	**	0.030[d,g]	3/110	0.0002 - 0.01	0.0001	0.0001	0.0001	CSL		NA
Benzo(a)pyrene	**	0.030[d,g]	2/110	0.0002 - 0.0027	0.0001	0.0001	0.0001	CSL		NA
Bis(2-ethylhexyl)phthalate	**	0.030[d,g]	1/76	0.004		0.003	0.00282	CSL		NA
Fluoranthene	**	0.030[d,g]	5/110	0.0002 - 0.01	0.0001	0.00093	0.00093	CSL		NA
Naphthalene	**	0.030[d,g]	6/219	0.0005 - 0.67	0.0002	0.0056	0.0056	CSL		NA
Pyrene	**	0.030[d,g]	11/110	0.0002 - 0.01	0.0001	0.00051	0.00051	CSL		NA
VOCs (mg/L)										
1,1-Dichloroethane	**	11.3[d,h]	57/256	0.0005 - 0.2	0.0001	2.5	0.0611	CSL		NA

TABLE G-26: OU-2B GROUNDWATER DETECTED CONSTITUENT SCREENING -- SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Chemical	SCREENING LEVELS MARINE[a]		Frequency of Detection	Reporting Limit	Minimum Concentration	Maximum Concentration	EPC[c]	Screening Evaluation		Hazard Quotient
	CCC	CMC[b]						Rejected	Retained	
VOCs (Continued) (mg/L)										
1,1-Dichloroethene	**	22.4[d,j]	54/256	0.0005 - 0.2	0.0002	4	0.151	CSL		NA
1,1,1-Trichloroethane	**	3.12[d]	14/256	0.0005 - 0.2	0.0004	0.048	0.00698	CSL		NA
1,1,2-Trichloroethane	**	3.12[d,j]	10/256	0.0005 - 0.2	0.0004	0.065	0.00724	FOD		NA
1,2-Dichlorobenzene	0.129[d]	NA	32/292	0.0005 - 0.17	0.0001	0.24	0.0121	CDL		NA
1,2-Dichloroethane	**	11.3[d]	19/256	0.0005 - 0.17	0.0002	0.096	0.00603	CSL		NA
1,2-Dichloroethene (total)	**	22.4[d]	51/122	0.002 - 0.2	0.0003	5.2	0.311	CSL		NA
1,2-Dichloropropane	**	0.079[d]	1/256	0.0005 - 0.2	0.0001	0.0001	0.0001	FOD		NA
1,2,4-Trichloromethylbenzene	**	**	8/128	0.0005 - 0.17	0.0002	0.046	0.00841		X	NA
1,3-Dichlorobenzene	0.129[d,k]	NA	6/292	0.0005 - 0.17	0..00007	0.0045	0.0045	FOD		NA
1,3,5-Trichloromethylbenzene	**	**	6/128	0.0004 - 0.17	0.0002	0.02	0.00795	FOD		NA
1,4-Dichlorobenzene	0.129[d]	NA	22/292	0.0005 - 0.17	0.0003	0.048	0.00561	CSL		NA
2-Butanone	**	**	1/231	0.0007 - 3.3	0.0086	0.0086	0.0086	FOD		NA
2-Hexanone	**	**	1/232	0.002 - 3.3	0.002	0.002	0.002	FOD		NA
4-Methyl-2-Pentanone	**	**	5/237	0.002 - 3.3	0.0007	0.029	0.029	FOD		NA
Acetone	**	**	22/231	0.0004 - 3.3	0.0005	63	1.54		X	NA
Benzene	0.7[d]	NA	37/256	0.0005 - 0.17	0.0001	0.55	0.0238	CSL		NA
Bromodichloromethane	6.4[d]	**	7/256	0.0005 - 0.2	0.0009	0.01	0.00652	FOD		NA
Carbon Disulfide	**	**	42/237	0.0005 - 0.2	0.002	0.017	0.00707		X	NA
Chlorobenzene	0.129[d]	NA	18/256	0.0005 - 0.2	0.0005	0.02	0.0067	CSL		NA
Chloroethane	**	**	9/256	0.001 - 0.33	0.0004	0.037	0.00978	FOD		NA
Chloroform	**	**	10/256	0.0005 - 0.2	0.0001	0.034	0.00664	FOD		NA
Chloromethane	**	**	4/256	0.001 - 0.33	0.0003	0.01	0.00952	FOD		NA
Ethylbenzene	**	0.043[d]	20/256	0.0002 - 0.2	0.0003	0.15	0.0091	CSL		NA
Hexachlorobutadiene	**	**	1/185	0.0005 - 0.17	0.0004	0.0004	0.0004	FOD		NA
Isopropylbenzene	**	**	6/109	0.0005 - 0.17	0.0005	0.0055	0.0055		X	NA
Methy-T-Butyl Ether	**	**	11/229	0.0001 - 0.17	0.0001	0.0016	0.0016	FOD		NA
Methylene Chloride	6.4[d]	**	1/256	0.0001 - 1.7	0.075	0.075	0.014	FOD		NA
Tert-Butanol	**	**	12/73	0.01 - 3.3	0.0027	0.5	0.286		X	NA
Tetrachloroethene	0.45[d]	NA	12/256	0.0005 - 0.2	0.0002	0.003	0.003	CSL		NA
Toluene	5[d]	NA	45/256	0.0005 - 0.2	0.0001	0.016	0.00655	CSL		NA
Trichloroethene	NV	0.2[d]	103/256	0.0005 - 0.2	0.0002	19	0.786		X	**0.393**
Vinyl Chloride	**	**	62/256	0.0005 - 0.17	0.0003	1.4	0.0335		X	NA
Xylene	**	**	23/128	0.001 - 0.2	0.0003	0.32	0.0186		X	NA

TABLE G-26: OU-2B GROUNDWATER DETECTED CONSTITUENT SCREENING -- SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes:

a	Based on the California Toxics Rule Criteria (EPA) for Enclosed Bays and Estuaries, Saltwater Aquatic Life Protection, unless otherwise specified. See full reference below.
b	When the chronic criteria, the CCC, was not available, the published acute criteria, the CMC, divided by an uncertainty factor of 10 was used. The CMC was divided by 10 to estimate chronic effects.
c	The EPC was the lower value of the maximum detected concentration or the UCL95.
d	California Toxics Rule Criteria not available; therefore, value from EPA National AWQC, Saltwater Aquatic Life Protection as presented in the NOAA SQuIRT Tables. See full reference below.
e	Based on chromium 6+
f	Based on inorganic mercury
g	Value is was derived for chemical class
h	Based on a similar compound, 1,2-dichloroethane
i	Based on a similar compound, 1,2-dichloroethene
j	Based on a similar compound, 1,1,1-trichloroethane
k	Based on similar compounds 1,2-dichlorobenzene and 1,4-dichlorobenzene

AWQC	Ambient water quality criteria	mg/L	Milligram per Liter
CCC	Criteria continuous concentration	NA	Not applicable
CDL	Maximum diluted concentration (1/10) within screening level concentrati	NB	Nonbioaccumulating
CMC	Criteria maximum concentration	NOAA	National Oceanic and Atmospheric Administration
CSB	Concentration within statistical background	NV	No value available
CSL	EPC within screening level concentration	SQuIRT	Screening Quick Reference Tables
EN	Essential nutrient	SVOC	Semivolatile organic chemical
EPA	U.S. Environmental Protection Agency	UCL95	95th percentile upper confidence limit on the arithmetic mean
EPC	Exposure point concentration	VOC	Volatile organic chemical
FOD	Frequency of detection less than 5 percent		

** California Toxic Rule Criteria or EPA AWQC not available

<u>References</u>:

California Environmental Protection Agency, Regional Water Quality Control Board Central Valley Region. 2000. A Compilation of Water Quality Goals. August.

NOAA. 1999. NOAA SQuIRTs. Hazmat Report 99-1. Updated September.

TABLE G-27: SITE 3 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	MEASUREMENT ENDPOINTS							
	Reproductive or physiological impacts to the California ground squirrel		Reproductive or physiological impacts to the Alameda song sparrow		Reproductive or physiological impacts to the American robin		Reproductive or physiological impacts to the Red-tailed hawk	
	HAZARD QUOTIENT							
	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV
Aluminum	1.09E+02[a]	1.09E+03[a]	1.07E-01[a]	9.68E-01[a]	3.39E-01[a]	3.09E+00[a]	1.77E+00[a]	1.62E+01[a]
Arsenic	1.66E-01[b]	8.62E-01[b]	4.73E-04[a]	1.89E-03[a]	1.53E-03[a]	6.12E-03[a]	6.32E-03[a]	2.53E-02[a]
Barium	2.40E-01[b]	7.59E-01[b]	6.83E-02[a]	1.37E-01[a]	2.18E-01[a]	4.36E-01[a]	1.03E+00[a]	2.07E-01[a]
Cobalt	1.70E-02[a]	2.10E-01[a]	QE	QE	QE	QE	QE	QE
Copper	1.90E-02[b]	3.75E+00[b]	1.56E-03[b]	2.07E-02[b]	5.08E-03[b]	6.77E-02[b]	1.02E-02[b]	1.36E-01[b]
Lead	3.45E-01[b]	8.63E+00[a]	3.13E-02[a]	2.28E+02[a]	1.04E-01[a]	7.63E+02[a]	2.52E-01[a]	1.84E+03[a]
Alternate Lead TRV[c]	NA	NA	NA	6.29E-01[a]	NA	2.10E+00[a]	NA	5.07E+00[a]
Manganese	4.55E-01[a]	4.57E+00[a]	2.85E-03[a]	2.85E-02[a]	9.05E-03[a]	9.05E-02[a]	4.46E-02[a]	4.46E-01[a]
Vanadium	4.46E-01[a]	4.46E+00[a]	2.82E-04[b]	2.82E-03[b]	8.97E-04[b]	8.97E-03[b]	4.68E-02[b]	4.68E-02[b]
Zinc	3.91E-02[a]	1.02E+01[b]	3.02E-03[b]	3.02E-02[b]	9.51E-03[b]	9.51E-02[b]	5.41E-02[b]	5.41E-01[b]
HMW PAHs	7.51E-03[b]	1.88E-01[b]	QE	QE	QE	QE	QE	QE
LMW PAHs	1.18E-04[a]	3.47E-04[a]	QE	QE	QE	QE	QE	QE
2-Butanone	QE	QE	QE	QE	QE	QE	QE	QE
Acetone	1.60E-03[b]	7.96E-03[b]	QE	QE	QE	QE	QE	QE
Benzene	3.43E-02[a]	3.43E-01[a]	QE	QE	QE	QE	QE	QE
Carbon disulfide	QE	QE	QE	QE	QE	QE	QE	QE
Ethylbenzene	QE	QE	QE	QE	QE	QE	QE	QE
Toluene	2.37E+00[a]	2.37E+01[a]	QE	QE	QE	QE	QE	QE
Xylene	6.62E+02[a]	8.15E+02[a]	QE	QE	QE	QE	QE	QE

Notes:

a TRV based on an reproductive effect.

b TRV based on an physiological effect.

c The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes an alternate, less conservative, low TRV of 3.85 mg/kg-day, as referenced by Sample and others (1996), was used.

TABLE G-27: SITE 3 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT
Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Notes (Continued):

COPC	Chemical of potential concern
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
PAH	Polynuclear aromatic hydrocarbon
QE	No TRV developed for Ecological COPC and endpoint, qualitative evaluation only
TRV	Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE G-28: SITE 4 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 3, 4, 11, and, and 21, Alameda Point, Alameda, California

Ecological COPC	MEASUREMENT ENDPOINTS							
	Reproductive or physiological impacts to the California ground squirrel		Reproductive or physiological impacts to the Alameda song sparrow		Reproductive or physiological impacts to the American robin		Reproductive or physiological impacts to the Red-tailed hawk	
	HAZARD QUOTIENT							
	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV
Antimony	1.78E-01[a]	9.20E-01[a]	4.81E-04[b]	1.92E-03[b]	1.53E-03[b]	6.12E-03[b]	7.09E-03[b]	2.84E-02[b]
Arsenic	3.59E-02[a]	1.86E-01[a]	1.02E-04[b]	4.08E-04[b]	3.30E-04[b]	1.32E-03[b]	1.36E-03[b]	5.46E-03[b]
Barium	6.47E-02[a]	2.05E-01[a]	1.84E-02[b]	3.71E-02[b]	5.88E-02[b]	1.18E-01[b]	2.77E-01[b]	5.58E-01[b]
Cadmium	2.37E+00[b]	1.02E+02[b]	6.54E-02[a]	5.71E-01[a]	2.05E-01[a]	1.78E+00[a]	1.17E+00[a]	1.02E+01[a]
Chromium	4.21E-02[a]	1.69E-01[a]	3.32E-03[b]	1.66E-02[b]	1.14E-02[b]	5.68E-02[b]	1.78E-02[b]	8.90E-02[b]
Chromium 6+	1.18E-03[a]	4.74E-03[a]	9.34E-05[b]	4.66E-04[b]	3.20E-04[b]	1.60E-03[b]	5.01E-04[b]	2.50E-03[b]
Copper	8.45E-03[a]	1.67E+00[a]	6.91E-04[a]	9.19E-03[a]	2.26E-03[a]	3.00E-02[a]	4.55E-03[a]	6.04E-02[a]
Lead	3.00E-02[a]	7.49E-01[b]	2.71E-03[b]	1.98E+01[b]	9.03E-03[b]	6.62E+01[b]	2.18E-02[b]	1.60E+02[b]
Alternate Lead TRV[c]	NA	NA	NA	5.45E-02[b]	NA	1.82E-01[b]	NA	4.40E-01[b]
Manganese	2.19E-01[b]	2.20E+00[b]	1.37E-03[b]	1.37E-02[b]	4.36E-03[b]	4.36E-02[b]	2.15E-02[b]	2.15E-01[b]
Mercury	3.72E-03[a]	5.97E-02[a]	2.75E-03[b]	1.27E-02[b]	8.63E-03[b]	3.98E-02[b]	5.15E-02[b]	2.37E-01[b]
Molybdenum	2.10E-01[b]	2.10E+00[b]	4.15E-05[b]	4.19E-04[b]	1.32E-04[b]	1.34E-03[b]	6.51E-04[b]	6.56E-03[b]
Nickel	2.11E-02[b]	5.01E+00[b]	6.55E-04[a]	2.45E-02[a]	2.21E-03[a]	8.25E-02[a]	4.49E-03[a]	1.68E-01[a]
Silver	QE	QE	QE	QE	QE	QE	QE	QE
Vanadium	2.46E-01[b]	2.46E+00[b]	1.55E-04[a]	1.55E-03[a]	4.93E-04[a]	4.94E-03[a]	2.58E-03[a]	2.58E-02[a]
Zinc	6.48E-03[b]	1.69E+00[a]	5.00E-04[a]	5.00E-03[a]	1.58E-03[a]	1.58E-02[a]	8.96E-03[a]	8.96E-02[a]
HMW PAHs	3.37E-03[a]	8.42E-02[a]	QE	QE	QE	QE	QE	QE
LMW PAHs	1.67E-05[b]	4.90E-05[b]	QE	QE	QE	QE	QE	QE
Bis(2-ethylhexyl)phthalate	5.19E+00[b]	5.19E+01[b]	1.97E+02[b]	1.97E+03[b]	1.55E+01[b]	1.55E+02[b]	1.18E+03[b]	1.08E+04[b]
n-Nitroso-diphenylamine	QE	QE	QE	QE	QE	QE	QE	QE
Pentachlorophenol	3.06E+00[a]	3.06E+01[a]	QE	QE	QE	QE	QE	QE
1,1,1-Trichloroethane	3.28E-06[b]	3.28E-05[b]	QE	QE	QE	QE	QE	QE
Ethylbenzene	QE	QE	QE	QE	QE	QE	QE	QE
Toluene	1.01E-03[b]	1.01E-02[b]	QE	QE	QE	QE	QE	QE
Xylene	2.31E-01[b]	2.84E-01[b]	QE	QE	QE	QE	QE	QE

TABLE G-28: SITE 4 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 3, 4, 11, and, and 21, Alameda Point, Alameda, California

Notes:

a	TRV based on an physiological effect.
b	TRV based on an reproductive effect.
c	The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes an alternate, less conservative, low TRV of 3.85 mg/kg-day, as referenced by Sample and others (1996), was used.

COPC	Contaminant of potential concern
HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
PAH	Polynuclear aromatic hydrocarbon
QE	No TRV developed for Ecological COPC and endpoint, qualitative evaluation only
TRV	Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

TABLE G-29: SITE 11 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda, California

Ecological COPC	MEASUREMENT ENDPOINTS							
	Reproductive or physiological impacts to the California ground squirrel		Reproductive or physiological impacts to the Alameda song sparrow		Reproductive or physiological impacts to the American robin		Reproductive or physiological impacts to the Red-tailed hawk	
	HAZARD QUOTIENT							
	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV
Beryllium	2.73E-03[a]	2.73E-02[a]	QE	QE	QE	QE	QE	QE
Cobalt	1.47E-02[b]	1.81E-01[b]	QE	QE	QE	QE	QE	QE
Copper	1.00E-02[a]	1.97E+00[a]	8.18E-04[a]	1.09E-02[a]	2.74E-03[a]	3.64E-02[a]	5.38E-03[a]	7.15E-02[a]
Lead	5.60E-02[a]	1.40+00[b]	5.07E-03[b]	3.69E+01[b]	1.75E-02[b]	1.28E+02[b]	4.08E-02[b]	2.99E+02[b]
Alternate Lead TRV[c]	NA	NA	NA	1.02E-01[b]	NA	3.53E-01[b]	NA	8.22E-01[b]
Manganese	3.93E-01[b]	3.94E+00[b]	2.46E-03[b]	2.46E-02[b]	7.91E-03[b]	7.91E-02[b]	3.86E-02[b]	3.86E-01[b]
Vanadium	3.56E-01[b]	3.56E+00[b]	2.25E-04[a]	2.25E-03[a]	7.24E-04[a]	7.24E-03[a]	3.73E-03[a]	3.73E-02[a]
Zinc	8.01E-03[b]	2.09E+00[a]	6.18E-04[a]	6.18E-03[a]	1.96E-03[a]	1.96E-02[a]	1.11E-02[a]	1.11E-01[a]
HMW PAHs	1.46E-02[a]	3.65E-01[a]	QE	QE	QE	QE	QE	QE
LMW PAHs	7.13E-05[b]	2.09E-04[b]	QE	QE	QE	QE	QE	QE
Chloroform	1.17E-05[b]	3.20E-05[b]	QE	QE	QE	QE	QE	QE

Notes:

a TRV based on an physiological effect.

b TRV based on an reproductive effect.

c The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes an alternate, less conservative, low TRV of 3.85 mg/kg-day, as referenced by Sample and others (1996), was used.

COPC Chemical of potential concern
HMW High molecular weight
LMW Low molecular weight
mg/kg-day Milligram per kilogram per day
NA Not applicable
PAH Polynuclear aromatic hydrocarbon
QE No TRV developed for Ecological COPC and endpoint, qualitative evaluation only
TRV Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory.

Oak Ridge, Tennessee.

TABLE G-30: SITE 21 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda

Ecological COPC	MEASUREMENT ENDPOINTS							
	Reproductive or physiological impacts to the California ground squirrel		Reproductive or physiological impacts to the Alameda song sparrow		Reproductive or physiological impacts to the American robin		Reproductive or physiological impacts to the Red-tailed hawk	
	HAZARD QUOTIENT							
	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV	High TRV	Low TRV
Aluminum	1.31E+02[a]	1.31E+03[a]	1.29E-01[a]	1.17E+00[a]	4.15E-01[a]	3.79E+00[a]	2.14E+00[a]	1.96E+01[a]
Arsenic	5.28E-02[b]	2.73E-01[b]	1.50E-04[a]	6.00E-04[a]	4.96E-04[a]	1.98E-03[a]	2.01E-03[a]	8.02E-03[a]
Barium	9.41E-02[b]	2.98E-01[b]	2.68E-02[a]	5.40E-02[a]	8.66E-02[a]	1.73E-01[a]	4.03E-01[a]	8.12E-01[a]
Beryllium	4.35E-03[b]	4.35E-02[b]	QE	QE	QE	QE	QE	QE
Cobalt	2.13E-02[a]	2.63E-01[a]	QE	QE	QE	QE	QE	QE
Copper	1.44E-02[b]	2.83E+00[b]	1.17E-03[b]	1.56E-02[b]	3.93E-03[b]	5.24E-02[b]	7.74E-03[b]	1.03E-01[b]
Lead	1.37E-01[b]	3.43E+00[a]	1.24E-02[a]	9.06E+01[a]	4.29E-02[a]	3.15E+02[a]	1.00E-01[a]	7.32E+02[a]
Alternate Lead TRV[c]	NA	NA	NA	2.50E-01[a]	NA	8.67E-01[a]	NA	2.02E+00[a]
Manganese	4.65E-01[a]	4.67E+00[a]	2.91E-03[a]	2.91E-02[a]	9.36E-03[a]	9.36E-02[a]	4.56E-02[a]	4.56E-01[a]
Vanadium	5.33E-01[a]	5.33E+00[a]	3.36E-04[b]	3.36E-03[b]	1.08E-03[b]	1.08E-02[b]	5.59E-03[b]	5.59E-02[b]
Zinc	1.60E-02[a]	4.17E+00[b]	1.23E-03[b]	1.23E-02[b]	3.91E-03[b]	3.91E-02[b]	2.21E-02[b]	2.21E-01[b]
DDTt	2.13E-04[a]	4.27E-03[a]	1.27E-04[a]	4.70E-03[a]	3.98E-04[a]	1.47E-02[a]	3.30E-02[a]	1.23E+00[a]
Total PCBs	6.04E-02[b]	2.37E-01[b]	1.48E-04[a]	5.22E-03[a]	4.65E-03[a]	1.63E-02[a]	3.84E-02[a]	1.36E+00[a]
HMW PAHs	7.00E-04[b]	1.75E-02[b]	QE	QE	QE	QE	QE	QE
LMW PAHs	5.18E-06[a]	1.52E-05[a]	QE	QE	QE	QE	QE	QE

Notes:

a TRV based on an reproductive effect.

b TRV based on an physiological effect.

c The Navy established avian low TRV of 0.014 mg/kg-day is considered highly conservative. For comparison purposes an alternate, less conservative, low TRV of 3.85 mg/kg-day, as referenced by Sample and others (1996), was used.

COPC Chemical of potential concern

DDT Dichlorodiphenyltrichloroethane

DDTt Sum of 4,4-dichlorodiphenyldichloroethane, 4,4-dichlorodiphenyldichloroethene, and 4,4-dichlorodiphenyltrichloroethane

TABLE G-30: SITE 21 - SURFACE SOIL HAZARD QUOTIENT BY MEASUREMENT ENDPOINT

Ecological Risk Assessment for Sites 3, 4, 11, and 21, Alameda Point, Alameda

Notes (Continued):

HMW	High molecular weight
LMW	Low molecular weight
mg/kg-day	Milligram per kilogram per day
NA	Not applicable
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
QE	No TRV developed for Ecological COPC and endpoint, qualitative evaluation only
TRV	Toxicity reference value

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter, II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

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N00236.002772
ALAMEDA POINT
SSIC NO. 5090.3

APPENDIX G
DRAFT ECOLOGICAL RISK ASSESSMENT

ATTACHMENT A- ECOTOXICOLOGICAL PROFILES FOR ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

DRAFT OPERABLE UNIT 2B
REMEDIAL INVESTIGATION REPORT
SITES 3, 4, 11, AND 21

THE ABOVE IDENTIFIED ATTACHMENT IS NOT AVAILABLE.

EXTENSIVE RESEARCH WAS PERFORMED BY SOUTHWEST DIVISION TO LOCATE THIS ATTACHMENT. THIS PAGE HAS BEEN INSERTED AS A PLACEHOLDER AND WILL BE REPLACED SHOULD THE MISSING ITEM BE LOCATED.

QUESTIONS MAY BE DIRECTED TO:

DIANE C. SILVA
RECORDS MANAGEMENT SPECIALIST
NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132

TELEPHONE: (619) 532-3676

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APPENDIX E

VALIDATION REPORTS FOR IWTP 360 (INCLUDES CHAIN OF CUSTODY FORMS) AT IWTP 360, ALAMEDA POINT, ALAMEDA, CALIFORNIA

Technical Review Addendum

To Validation Report

For SDG # AVP 01

Technical Review Addendum
to
Validation Report

DATA VALIDATION REPORT ADDENDUM
MODIFICATION TO THE REPORT
AVP01

Prepared by:	John Swanson, Tetra Tech EM, Inc.
Date:	6/1/04
Site Name/Job Number:	Alameda/G9016.033.05.02
Laboratory:	Applied Physics and Chemistry Laboratory (APCL), Chino, California
Data Validation Firm:	Laboratory Data Consultants, Inc.

There were no modifications to the validation report.

Data Validation Report

DATA VALIDATION REPORT

Site:	NAS Alameda Point
Contract Task Order (CTO) No.:	G91060330502
Laboratory:	Applied P & Ch Laboratory
Data Reviewer:	Richard Amano, Stacey Swenson, Ming Hwang, and Steve Ziliak.
Firm/Proj. No:	Laboratory Data Consultants, Inc./11991A
Review Date:	May 24, 2004
Sample Delivery Group (SDG) No.:	AVP01

Sample Nos.:			
	033-IWTP360-019	033-IWTP360-030	033-IWTP360-019MSD
	033-IWTP360-020*	033-IWTP360-029	033-IWTP360-019DUP
	033-IWTP360-023*	033-IWTP360-035	033-IWTP360-020MS
	033-IWTP360-025*	033-IWTP360-036	033-IWTP360-020MSD
	033-IWTP360-027*	033-IWTP360-019MS	033-IWTP360-020DUP
	033-IWTP360-028		

* Full Validation Sample

Matrix: Soil and Water

Collection Date(s): March 5, 2004

The data were qualified according to the U.S. Environmental Protection Agency (EPA) documents "USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Data Review" (February 1994). In addition, the Tetra Tech EMI, Inc. documents "Data Validation Guidelines for CLP Inorganic Analyses" (March 1997), and the document entitled "PRC Comprehensive Long-term Environmental Action Navy II Analytical Services Statement of Work" (September 1998) were used along with other specified criteria in EPA methods. Data validation requirements are presented below.

I certify that all data validation criteria outlined in the above referenced documents were assessed, and any qualifications made to the data were in accordance with those documents.

Certified by Richard Amano
Principal Chemist

DATA VALIDATION REQUIREMENTS

Full validation includes all parameters listed below. Cursory validation parameters are indicated by an asterisk (*).

CLP Organic Parameters

*	Holding times
	GC/MS instrument performance check
*	Initial and continuing calibrations
*	Blanks
*	Surrogate recovery
*	Matrix spike/matrix spike duplicate
*	Laboratory control sample or blank spike
*	Field duplicates
*	Internal standard performance
	Target compound identification
	Tentatively identified compounds
	Compound quantitation
	Reported detection limits
	System performance
*	Overall assessment of data for the SDG

CLP Inorganic Parameters

*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
	ICP interference check sample
	GFAA quality control
*	ICP serial dilution
	Sample result verification
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

Non-CLP Organic and Inorganic Parameters

*	Method compliance
*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike/matrix spike duplicate
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
*	Surrogate recovery
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

DATA VALIDATION QUALIFIERS AND CODES

Data Validation Qualifiers

UJ Estimated nondetected result

J Estimated detected result

R Rejected result

NJ Tentatively Identified Compound (TIC)

Data Validation Qualifier Codes

a Surrogate recovery exceedance

b Laboratory method blank and common blank contamination, Field blank contamination

c Matrix spike/Matrix spike duplicates recovery exceedance

d Duplicate precision exceedance

e Internal standard exceedance

f Calibration exceedance

g Quantification below reporting limit

h Other qualifications

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP AVP01

Sample ID	Matrix	Date Collected	Quality Control ID	Validation Criteria*	Analyses: METALS						
033-IWTP360-019	Soil	3/5/04	MS/MSD/DUP		X						
033-IWTP360-020	Water	3/5/04	MS/MSD/DUP	Full	X						
033-IWTP360-023	Water	3/5/04		Full	X						
033-IWTP360-025	Soil	3/5/04		Full	X						
033-IWTP360-027	Soil	3/5/04		Full	X						
033-IWTP360-028	Soil	3/5/04			X						
033-IWTP360-030	Water	3/5/04	FIELD DUPLICATE OF 033-IWTP360-029		X						
033-IWTP360-029	Water	3/5/04			X						
033-IWTP360-035	Soil	3/5/04			X						
033-IWTP360-036	~~Soil~~ WATER	3/5/04			X						
	95 6-1-04		JB 6-1-04								

* = Cursory validation performed on all samples
*** = Full review performed on indicated parameters only
MS/MSD = Matrix Spike/Matrix Spike Duplicate
** = MS/MSD/DUP performed on indicated parameters only
DUP = Matrix duplicate

DATA ASSESSMENT

METALS ANALYSIS (EPA SW 846 Methods 6010B and 7000)

I. Holding Times

A. The 6 month and 28 day holding time requirements were met for TAL Metals and Mercury, respectively.

II. Calibrations

A. All instruments were calibrated daily and the proper number of standards were used in accordance with the SW 846 methods.

B. All initial and continuing calibration verifications (ICV and CCV) recoveries were within the 90-110% QC Limits (80-120% for Mercury). CRDL Standards for ICP and AA were analyzed with each analytical run and recoveries were within the ≥75% QC limits with the exception listed below.

C. *Due to calibration problems, the following detected results are estimated (Jf).*

- Copper in samples: 033-IWTP360-019, 033-IWTP360-020*, 033-IWTP360-023*, 033-IWTP360-025*, 033-IWTP360-027*, 033-IWTP360-028, 033-IWTP360-030, 033-IWTP360-029, 033-IWTP360-035, 033-IWTP360-036

The CRDL (3/10/04 11:05) percent recovery for Copper was 128.8% , outside the control limits of 75-125%.

D. The Interelement Correction Factor (IEC) was performed annually and the Instrument Detection Limit (IDL) and Linear Range Analysis (LRA) were analyzed quarterly.

III. Blank Contamination

A. Due to calibration and method blank contamination, the following results are considered nondetected (UJb).

- Aluminum in sample: 033-IWTP360-030
- Antimony in samples: 033-IWTP360-020*, 033-IWTP360-023*, 033-IWTP360-029, 033-IWTP360-025*, 033-IWTP360-036
- Arsenic in samples: 033-IWTP360-023*, 033-IWTP360-036, 033-IWTP360-019, 033-IWTP360-035
- Barium in samples: 033-IWTP360-020*, 033-IWTP360-023*
- Beryllium in samples: 033-IWTP360-020*, 033-IWTP360-023*, 033-IWTP360-029

• Cadmium in samples	033-IWTP360-020*	033-IWTP360-036	033-IWTP360-027*
	033-IWTP360-023*	033-IWTP360-019	033-IWTP360-028
	033-IWTP360-029		033-IWTP360-035
• Cobalt in samples	033-IWTP360-020*	033-IWTP360-029	033-IWTP360-036
	033-IWTP360-023*	033-IWTP360-030	
• Copper in samples	033-IWTP360-020*	033-IWTP360-030	033-IWTP360-019
	033-IWTP360-023*	033-IWTP360-036	033-IWTP360-035
	033-IWTP360-029		
• Mercury in samples	033-IWTP360-020*	033-IWTP360-030	033-IWTP360-019
	033-IWTP360-023*	033-IWTP360-036	033-IWTP360-028
	033-IWTP360-029		
• Iron and Manganese in sample		033-IWTP360-020*	
• Lead in samples	033-IWTP360-020*	033-IWTP360-030	033-IWTP360-036
	033-IWTP360-029		
• Selenium in sample	033-IWTP360-036		
• Sodium in sample	033-IWTP360-025*		
• Silver in samples	033-IWTP360-020*	033-IWTP360-030	033-IWTP360-027*
	033-IWTP360-029	033-IWTP360-019	
• Nickel, Vanadium, and Zinc in samples		033-IWTP360-020*	033-IWTP360-030
		033-IWTP360-029	
• Molybdenum in samples	033-IWTP360-019	033-IWTP360-025*	033-IWTP360-027*

The following metals were detected in the associated calibration and method blanks at the concentrations noted below.

Analyte	Blank ID	Concentration
Aluminum	ICB/CCB	15.31 ug/L
Antimony	ICB/CCB	3.64 ug/L
Arsenic	ICB/CCB	-2.88 ug/L
Barium	ICB/CCB	5.09 ug/L
Beryllium	ICB/CCB	0.63 ug/L
Cadmium	ICB/CCB	1.17 ug/L
Cobalt	ICB/CCB	1.86 ug/L
Copper	PB	3.6 ug/L
Copper	ICB/CCB	8.34 ug/L
Iron	PB	3.4 ug/L
Iron	ICB/CCB	11.74 ug/L
Lead	ICB/CCB	1.98 ug/L
Manganese	PB	0.42 ug/L

Analyte	Blank ID	Concentration
Manganese	ICB/CCB	2.70 ug/L
Mercury	PB	0.023 ug/L
Mercury	ICB/CCB	0.03 ug/L
Nickel	ICB/CCB	1.78 ug/L
Selenium	ICB/CCB	-5.39 ug/L
Silver	ICB/CCB	1.49 ug/L
Vanadium	ICB/CCB	1.86 ug/L
Zinc	PB	1.1 ug/L
Zinc	ICB/CCB	2.80 ug/L
Sodium	ICB/CCB	-463.64 ug/L
Molybdenum	ICB/CCB	2.83 ug/L
Copper	PB	0.065 mg/Kg
Mercury	PB	0.0061 mg/Kg
Silver	PB	0.036 mg/Kg

Detected results less than 5x the maximum blank contamination were qualified.

B. No field blank samples were identified in this SDG.

IV. Matrix Spike (MS)

A. The MS/MSD analysis was performed on samples 033-IWTP360-001, 033-IWTP360-019, and 033-IWTP360-020* and a non-client sample for all metals. Percent recoveries (%R) were within the 75-125% QC limits and the relative percent differences were within the QC limits of ≤20 for waters and ≤35 for soils.

V. Matrix Duplicate (DUP)

A. The DUP analysis was performed on samples 033-IWTP360-001, 033-IWTP360-019, and 033-IWTP360-020* and a non-client sample for all metals. Relative percent differences (RPD) were within the QC limits of ≤20 for waters and ≤35 for soils.

VI. Laboratory Control Sample (LCS)

A. The LCS QC samples were analyzed as required under the TTEMI SOW. The percent recoveries (%R) were within the QC limits.

VII. ICP Serial Dilution

A. Samples 033-IWTP360-019 and 033-IWTP360-020* were used for the ICP serial dilution analysis.

B. Due to ICP serial dilution problems, the following detected results are qualified as estimated (Jh).

- Potassium in samples 033-IWTP360-020* 033-IWTP360-030 033-IWTP360-036 033-IWTP360-023* 033-IWTP360-029

The percent difference between the original sample result and the serial dilution result was outside the QC limits of 10% for analyte concentrations greater than 50x the IDL as shown below.

Sample ID	Analyte	Original Concentration	50x IDL	%D
033-IWTP360-020*	Potassium	4214.46 ug/L	550 ug/L	12.5

VIII. Field Duplicate

A. No field duplicate samples were identified in this SDG.

IX. Other Qualifications

A. The following results are qualified as estimated (Jg).

- All metals results above the IDL but below the RL.

Results above the IDL but below the RL are considered qualitatively acceptable but quantitatively unreliable due to uncertainties in the analytical precision near the limit of detection.

Full Validation Criteria for Samples 033-IWTP360-020, 033-IWTP360-023*, 033-IWTP360-025*, and 033-IWTP360-027**

X. Analyte Quantitation and Reported Detection Limits

A. Sample results were recalculated, with the proper dilution factors, weights, volumes, and percent moisture used to calculate the sample results. The samples were found to be correctly quantitated. The reported detection limits were consistent with Tetra Tech EMI's required report limits and reflect any dilutions, weights, volumes, and percent moisture.

XI. Graphite Furnace Atomic Absorption (GFAA) Analysis

A. Graphite furnace atomic absorption analysis was not utilized in this SDG.

XII. ICP Interference Check Sample

A. The levels of Aluminum, Calcium, Iron, and Magnesium in the sample were less than 50% of the spike amount.

OVERALL ASSESSMENT OF DATA

I. Method Compliance and Additional Comments

A. All analyses were conducted within all specifications of the requested methods.

II. Usability

<u>Metals Analysis</u>

A. No results for metals analysis were rejected in this SDG.

B. Due to instrument calibration, calibration and method blank contamination, and ICP serial dilution problems in the metals analysis, several samples were qualified as estimated. The findings were as follows:

- Due to CRDL standard recovery problems, Copper detected results were qualified as estimated in ten samples.
- Due to method and calibration blank problems, Aluminum, Iron, Manganese, Selenium, and Sodium were qualified as nondetect in one sample, Antimony, Cobalt, and Silver were qualified nondetect in five samples, Arsenic and Lead were qualified nondetect in four samples, Barium was qualified as nondetect in two samples, Beryllium, Nickel, Vanadium, Zinc, and Molybdenum were qualified as nondetect in three samples, Cadmium was qualified as nondetect in eight samples, and Copper and Mercury were qualified as nondetect in seven samples.
- Due to ICP serial dilution %D problems, Potassium detected results were qualified as estimated in five samples.
- All detected results reported above the IDL but below the RL were qualified as estimated.

C. No samples were reextracted or reanalyzed for metals analysis in this SDG.

III. The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the cursory and full data validation all other results are considered valid and usable for all purposes.

Final EDD Tables

PERCENT MOISTURE ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

Matrix : SOIL

Date: 06/01/04

TtEMI Sample ID / Units	033-IWTP360-019 (%MST)			033-IWTP360-025 (%MST)			033-IWTP360-027 (%MST)			033-IWTP360-028 (%MST)			033-IWTP360-035 (%MST)		
Sample Location	IWTP360-VE03-SO-5			IWTP360-VE05-SO-5			IWTP360-VE06-SO-3			IWTP360-VE06-SO-5			IWTP360-DP05-SO-8		
Sample Depth (ft)	4.16 - 4.66			4.50 - 5.00			2.50 - 3.00			4.50 - 5.00			4.00 - 4.50		
Date Sampled / SDG Number	03/05/04 AVP01			03/05/04 AVP01			03/05/04 AVP01			03/05/04 AVP01			03/05/04 AVP01		
Date Extracted / Analyzed	03/10/04 03/10/04			03/10/04 03/10/04			03/10/04 03/10/04			03/10/04 03/10/04			03/10/04 03/10/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
MOISTURE	10.3			12.9			7.8			14.6			10.0		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

Note :

METALS (TOTAL) ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

Matrix : SOIL

Page: 2
Date: 06/01/04

TtEMI Sample ID / Units	033-IWTP360-019 (MG/KG)			033-IWTP360-025 (MG/KG)			033-IWTP360-027 (MG/KG)			033-IWTP360-028 (MG/KG)			033-IWTP360-035 (MG/KG)		
Sample Location	IWTP360-VE03-SO-5			IWTP360-VE05-SO-5			IWTP360-VE06-SO-3			IWTP360-VE06-SO-5			IWTP360-DP05-SO-8		
Sample Depth (ft)	4.16 - 4.66			4.50 - 5.00			2.50 - 3.00			4.50 - 5.00			4.00 - 4.50		
Date Sampled / SDG Number	03/05/04 AVP01			03/05/04 AVP01			03/05/04 AVP01			03/05/04 AVP01			03/05/04 AVP01		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
ALUMINUM	3550			5470			4010			5240			4070		
ANTIMONY	0.49	U		0.82	UJ	b	0.48	U		0.52	U		0.49	U	
ARSENIC	1.0	UJ	b	7.7			4.5			4.9			1.5	UJ	b
BARIUM	51.0			279			154			192			58.9		
BERYLLIUM	0.029	U		0.030	U		0.028	U		0.030	U		0.029	U	
CADMIUM	0.094	UJ	b	4.5			0.26	UJ	b	0.30	UJ	b	0.13	UJ	b
CALCIUM	4860			29900			7710			5940			11000		
CHROMIUM	26.8			136			111			38.2			49.8		
COBALT	4.8			6.5			5.0			5.6			5.1		
COPPER	8.2	UJ	b,f	94.7	J	f	23.6	J	f	24.4	J	f	8.2	UJ	b,f
IRON	6980			16600			9090			10600			8340		
LEAD	4.7			264			71.7			56.9			7.8		
MAGNESIUM	2070			4930			2750			2650			2630		
MANGANESE	128			189			155			192			120		
MERCURY	0.035	UJ	b	0.13			0.047	J	g	0.038	UJ	b	0.069	J	g
MOLYBDENUM	0.63	UJ	b	0.49	UJ	b	0.64	UJ	b	5.1			0.12	U	
NICKEL	25.4			148			26.0			24.9			27.8		
POTASSIUM	276			608			463			590			427		
SELENIUM	0.58	U		0.60	U		0.56	U		0.61	U		0.58	U	
SILVER	0.58	UJ	b	1.5			0.89	UJ	b	0.13	U		0.12	U	
SODIUM	34	U		177	UJ	b	33	U		35	U		34	U	
THALLIUM	0.42	U		0.44	U		0.41	U		0.44	U		0.42	U	
VANADIUM	14.9			25.2			17.2			20.4			19.4		
ZINC	17.1			97.3			54.9			50.9			22.4		

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J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

METALS (TOTAL) ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

Matrix : WATER

Date: 06/01/04

TtEMI Sample ID / Units	033-IWTP360-020 (UG/L)			033-IWTP360-023 (UG/L)			033-IWTP360-029 (UG/L)			033-IWTP360-030 (UG/L)			033-IWTP360-036 (UG/L)		
Sample Location	IWTP360-VE03-GW-6			IWTP360-VE04-GW-6			IWTP360-VE06-GW-6			IWTP360-VE06-GW-6DUP			IWTP360-DP05-GW-7		
Sample Depth (ft)	7.00 - 7.00			6.00 - 6.00			8.00 - 10.00			8.00 - 10.00			8.00 - 8.00		
Date Sampled / SDG Number	03/05/04 AVP01			03/05/04 AVP01			03/05/04 AVP01			03/05/04 AVP01			03/05/04 AVP01		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
ALUMINUM	153			147			313			40.8	UJ	b	490		
ANTIMONY	3.8	UJ	b	8.8	UJ	b	3.7	UJ	b	2.2	U		7.4	UJ	b
ARSENIC	2.3	U		6.6	UJ	b	19.9			21.4			3.8	UJ	b
BARIUM	10.4	UJ	b	23.7	UJ	b	112			104			80.0		
BERYLLIUM	0.24	UJ	b	0.13	UJ	b	0.13	UJ	b	0.13	U		0.13	U	
CADMIUM	0.28	UJ	b	0.44	UJ	b	0.48	UJ	b	0.23	U		0.33	UJ	b
CALCIUM	40300			11600			83900			93100			76800		
CHROMIUM	47.6			5.1			4.5	J	g	3.7	J	g	274		
COBALT	0.30	UJ	b	0.32	UJ	b	0.89	UJ	b	0.74	UJ	b	4.4	UJ	b
COPPER	16.3	UJ	b,f	22.5	UJ	b,f	14.4	UJ	b,f	15.4	UJ	b,f	12.5	UJ	b,f
IRON	56.5	UJ	b	121			1200			389			626		
LEAD	2.3	UJ	b	1.2	U		3.6	UJ	b	2.2	UJ	b	7.3	UJ	b
MAGNESIUM	2480			4320			31900			34500			17800		
MANGANESE	2.0	UJ	b	403			1860			2000			52.3		
MERCURY	0.092	UJ	b	0.055	UJ	b	0.064	UJ	b	0.053	UJ	b	0.085	UJ	b
MOLYBDENUM	21.8			272			34.9			39.2			49.5		
NICKEL	2.6	UJ	b	26.5			7.3	UJ	b	8.2	UJ	b	78.3		
POTASSIUM	4210	J	h	881	J	h	19200	J	h	21800	J	h	10000	J	h
SELENIUM	2.6	U		2.6	U		2.6	U		2.6	U		10.9	UJ	b
SILVER	1.2	UJ	b	0.56	U		0.66	UJ	b	1.3	UJ	b	0.56	U	
SODIUM	25900			280000			56900			63700			86300		
THALLIUM	1.9	U		1.9	U		1.9	U		1.9	U		1.9	U	
VANADIUM	7.5	UJ	b	18.0			4.5	UJ	b	4.1	UJ	b	77.2		
ZINC	13.1	UJ	b	28.2			12.3	UJ	b	12.0	UJ	b	15.5		

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J - Estimated concentration

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h - Other problems, refer to data validation narrative
k - Holding time exceeded
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y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

Chain of Custody
and
Technical Review Checklist

CHAIN OF CUSTODY RECORD

Tetra Tech EM Inc.

10670 White Rock Road, Suite 100
Rancho Cordova, CA 95670
(916) 852-8300 FAX (916) 852-0307

DATE: 3/5/04
CHAIN OF CUSTODY NUMBER: № 6344
LABORATORY NUMBER: 042185
PAGE 3 OF 3

PROJECT NAME: IWTP 360 Cont Samp	PROJECT MANAGER: Glynis Foulk
PROJECT NUMBER: G9016 0330502	TELEPHONE NUMBER: 916-852-8300
PROJECT LOCATION: Alameda Point	DESTINATION LABORATORY: APCL
SAMPLER(S): B. Shelton	ADDRESS: 13760 Magnolia Ave
SAMPLER SIGNATURE(S): Brad Shelton	CITY: Chino STATE: CA ZIP: 91710
SITE CONTACT/ TELEPHONE NUMBER: " 916-853-4559	LABORATORY TELEPHONE NUMBER: 909-590-1828

REQUESTED ANALYSES

1988

SAMPLE IDENTIFICATION	DATE	TIME	MATRIX TYPE	NO/TYPE OF CONTAINERS	TURN AROUND TIME	CLP Metals	Molybdenum								REMARKS (GRAB, COMPOSITE, ETC.)
033-IWTP360-035	3/5/04	0920	Soil ~~Water~~	1-8oz jar	Standard	X	X								
033-IWTP360-019	↓	1045	↓	↓	↓	X	X								
033-IWTP360-024	↓	1145	↓	↓	↓	X	X								
033-IWTP360-025	↓	1155	↓	↓	↓	X	X								
033-IWTP360-020	↓	1240	Water	1-Liter Poly	↓	X	X								HNO_3
033-IWTP360-027	↓	1245	Soil	1-8oz jar	↓	X	X								
033-IWTP360-028	↓	1250	↓	↓	↓	X	X								
033-IWTP360-036	↓	1500	Water	1-Liter Poly	↓	X	X								HNO_3
033-IWTP360-023	↓	1550	↓	↓	↓	X	X								
033-IWTP360-030	↓	1645	↓	↓	↓	X	X								
033-IWTP360-029	↓	1650	↓	↓	↓	X	X								

SHIPPED VIA: Fedex
AIRBILL #: ______

SPECIAL INSTRUCTIONS:

RELINQUISHED BY (SIGNATURE)	PRINT NAME/ COMPANY	DATE	TIME	RECEIVED BY (SIGNATURE)	PRINT NAME/ COMPANY	DATE	TIME
				[signature]	Jason Narrio/APCL	3/9/04	2000
				RECEIVED AT LAB BY (PRINT AND SIGN):			

DISTRIBUTION: WHITE = LABORATORY YELLOW = PROJECT MANAGER PINK = FILE

DATA VALIDATION REPORT
Technical Reviewer's QC Checklist

SDG Number: AVPØ1

- [x] Copies of chain-of-custodies are present for all samples in the sample delivery group (SDG).
- [x] All samples in the SDG are listed in the analytical summary table and all the requested analyses are accurately tabulated.
- [x] All QC samples are identified on the tables such as equipment rinsates, field blanks, trip blanks, MS/MSD, and field duplicates.
- [x] Analytical result sheets or electronic deliverable data results are present for all samples and analyses identified on the analytical summary table.
- [x] Each analytical result with a qualifier has a comment code associated with it.
- [x] The MS/MSD and field duplicate samples that are discussed in the narrative match those identified on the analytical summary table.
- [x] Dilutions have been discussed in the narrative for all samples with elevated reporting limits.
- [x] The Overall Assessment in each section is thorough and mentions all issues where a problem arose. Field QC samples such as equipment rinsates, field blanks, and trip blanks are also discussed.
- [x] All qualifiers on the data tables are accounted for in the narrative.
- [ ]

PROGRESS CHECKLIST

- [x] Technical Review Completed
- [x] Review Comments Incorporated
- [ ] Missing items needed for completeness:____

- [x] Ready for binding and doctrack!

John Swanson
6-1-Ø4

dvtrchk.plt

Technical Review Addendum

To Validation Report

For SDG # AVP 02

Technical Review Addendum
to
Validation Report

DATA VALIDATION REPORT ADDENDUM
MODIFICATION TO THE REPORT
AVP02

Prepared by:	John Swanson, Tetra Tech EM, Inc.
Date:	6/2/04
Site Name/Job Number:	Alameda/G9016.033.05.02
Laboratory:	Applied Physics and Chemistry Laboratory (APCL), Chino, California
Data Validation Firm:	Laboratory Data Consultants, Inc.

There were no modifications to the validation report.

Data Validation Report

DATA VALIDATION REPORT

Site:	NAS Alameda Point
Contract Task Order (CTO) No.:	G91060330502
Laboratory:	Applied P & Ch Laboratory
Data Reviewer:	Richard Amano, Stacey Swenson, Ming Hwang, and Steve Ziliak.
Firm/Proj. No:	Laboratory Data Consultants, Inc./11991B
Review Date:	May 24, 2004
Sample Delivery Group (SDG) No.:	AVP02

Sample Nos.:			
	033-IWTP360-001	033-IWTP360-009	033-IWTP360-022
	033-IWTP360-002	033-IWTP360-011	033-IWTP360-031
	033-IWTP360-003	033-IWTP360-012	033-IWTP360-032
	033-IWTP360-004	033-IWTP360-013	033-IWTP360-034
	033-IWTP360-005	033-IWTP360-015	033-IWTP360-001MS
	033-IWTP360-006	033-IWTP360-018	033-IWTP360-001MSD
	033-IWTP360-007	033-IWTP360-021	033-IWTP360-001DUP
	033-IWTP360-008		

* Full Validation Sample

Matrix: Soil and Water

Collection Date(s): March 3 through March 4, 2004

The data were qualified according to the U.S. Environmental Protection Agency (EPA) documents "USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Data Review" (February 1994). In addition, the Tetra Tech EMI, Inc. documents "Data Validation Guidelines for CLP Inorganic Analyses" (March 1997), and the document entitled "PRC Comprehensive Long-term Environmental Action Navy II Analytical Services Statement of Work" (September 1998) were used along with other specified criteria in EPA methods. Data validation requirements are presented below.

I certify that all data validation criteria outlined in the above referenced documents were assessed, and any qualifications made to the data were in accordance with those documents.

Certified by Richard Amano
Principal Chemist

DATA VALIDATION REQUIREMENTS

Full validation includes all parameters listed below. Cursory validation parameters are indicated by an asterisk (*).

CLP Organic Parameters

*	Holding times
	GC/MS instrument performance check
*	Initial and continuing calibrations
*	Blanks
*	Surrogate recovery
*	Matrix spike/matrix spike duplicate
*	Laboratory control sample or blank spike
*	Field duplicates
*	Internal standard performance
	Target compound identification
	Tentatively identified compounds
	Compound quantitation
	Reported detection limits
	System performance
*	Overall assessment of data for the SDG

CLP Inorganic Parameters

*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
	ICP interference check sample
	GFAA quality control
*	ICP serial dilution
	Sample result verification
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

Non-CLP Organic and Inorganic Parameters

*	Method compliance
*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike/matrix spike duplicate
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
*	Surrogate recovery
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

DATA VALIDATION QUALIFIERS AND CODES

Data Validation Qualifiers

UJ Estimated nondetected result

J Estimated detected result

R Rejected result

NJ Tentatively Identified Compound (TIC)

Data Validation Qualifier Codes

a Surrogate recovery exceedance

b Laboratory method blank and common blank contamination, Field blank contamination

c Matrix spike/Matrix spike duplicates recovery exceedance

d Duplicate precision exceedance

e Internal standard exceedance

f Calibration exceedance

g Quantification below reporting limit

h Other qualifications

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP AVP02

Sample ID	Matrix	Date Collected	Quality Control ID	Validation Criteria*	Analyses						
					METALS						
033-IWTP360-001	Soil	3/3/04	MS/MSD/DUP		X						
033-IWTP360-002	Soil	3/3/04			X						
033-IWTP360-003	Soil	3/3/04			X						
033-IWTP360-004	Soil	3/3/04			X						
033-IWTP360-005	Water	3/3/04			X						
033-IWTP360-006	Water	3/3/04			X						
033-IWTP360-007	Water	3/3/04			X						
033-IWTP360-008	Water	3/3/04			X						
033-IWTP360-009	Water	3/3/04			X						
033-IWTP360-011	WATER ~~Soil~~	3/3/04	FIELD DUPLICATE OF 033-IWTP360-009		X						
033-IWTP360-012	Soil	3/4/04			X						
033-IWTP360-013	Soil	3/4/04			X						
033-IWTP360-015	Soil	3/4/04			X						
033-IWTP360-018	Soil	3/4/04			X						
033-IWTP360-021	Soil	3/4/04			X						
033-IWTP360-022	Soil	3/4/04			X						
033-IWTP360-031	Water	3/4/04	SOURCE BLANK		X						
033-IWTP360-032	Water	3/4/04	EQUIPMENT RINSATE		X						
033-IWTP360-034	Soil	3/5/04			X						

* = Cursory validation performed on all samples
*** = Full review performed on indicated parameters only
MS/MSD = Matrix Spike/Matrix Spike Duplicate
** = MS/MSD/DUP performed on indicated parameters only
DUP = Matrix duplicate

DATA ASSESSMENT

METALS ANALYSIS (EPA SW 846 Methods 6010B and 7000)

I. Holding Times

A. The 6 month and 28 day holding time requirements were met for TAL Metals and Mercury, respectively.

II. Calibrations

A. All instruments were calibrated daily and the proper number of standards were used in accordance with the SW 846 methods.

B. All initial and continuing calibration verifications (ICV and CCV) recoveries were within the 90-110% QC Limits (80-120% for Mercury). CRDL Standards for ICP and AA were analyzed with each analytical run and recoveries were within the ≥75% QC limits with the exception listed below.

C. Due to calibration problems, the following detected results are estimated (Jf).

- Copper in samples

033-IWTP360-001	033-IWTP360-008	033-IWTP360-018
033-IWTP360-002	033-IWTP360-009	033-IWTP360-021
033-IWTP360-003	033-IWTP360-011	033-IWTP360-022
033-IWTP360-004	033-IWTP360-012	033-IWTP360-031
033-IWTP360-005	033-IWTP360-013	033-IWTP360-032
033-IWTP360-006	033-IWTP360-015	033-IWTP360-034
033-IWTP360-007		

The CRDL (3/10/04 11:05) percent recovery for Copper was 128.8%, outside the control limits of 75-125%.

D. The Interelement Correction Factor (IEC) was performed annually and the Instrument Detection Limit (IDL) and Linear Range Analysis (LRA) were analyzed quarterly.

III. Blank Contamination

A. Due to calibration and method blank contamination, the following results are considered nondetected (UJb).

- Aluminum in samples

033-IWTP360-005	033-IWTP360-009	033-IWTP360-031
033-IWTP360-006	033-IWTP360-011	033-IWTP360-032
033-IWTP360-008		

- Antimony in samples

033-IWTP360-005	033-IWTP360-008	033-IWTP360-032
033-IWTP360-006	033-IWTP360-009	033-IWTP360-034
033-IWTP360-007	033-IWTP360-011	

• Arsenic in samples	033-IWTP360-001	033-IWTP360-012	033-IWTP360-021
	033-IWTP360-003	033-IWTP360-013	033-IWTP360-034
	033-IWTP360-004		
• Barium, Chromium, and Manganese in samples		033-IWTP360-031	033-IWTP360-032
• Cadmium in samples	033-IWTP360-005	033-IWTP360-011	033-IWTP360-018
	033-IWTP360-006	033-IWTP360-002	033-IWTP360-021
	033-IWTP360-007	033-IWTP360-004	033-IWTP360-022
	033-IWTP360-008	033-IWTP360-015	033-IWTP360-034
	033-IWTP360-009		
• Cobalt and Lead in samples	033-IWTP360-006	033-IWTP360-008	033-IWTP360-011
	033-IWTP360-007	033-IWTP360-009	
• Copper in samples	033-IWTP360-005	033-IWTP360-009	033-IWTP360-001
	033-IWTP360-006	033-IWTP360-011	033-IWTP360-003
	033-IWTP360-007	033-IWTP360-031	033-IWTP360-004
	033-IWTP360-008	033-IWTP360-032	
• Iron in samples	033-IWTP360-008	033-IWTP360-031	033-IWTP360-032
• Mercury in samples	033-IWTP360-005	033-IWTP360-009	033-IWTP360-001
	033-IWTP360-006	033-IWTP360-011	033-IWTP360-003
	033-IWTP360-007	033-IWTP360-031	033-IWTP360-004
	033-IWTP360-008	033-IWTP360-032	033-IWTP360-018
• Nickel in samples	033-IWTP360-005	033-IWTP360-011	033-IWTP360-032
	033-IWTP360-006	033-IWTP360-031	
• Selenium in sample	033-IWTP360-007		
• Silver in samples	033-IWTP360-006	033-IWTP360-031	033-IWTP360-013
	033-IWTP360-008	033-IWTP360-032	
• Vanadium in samples	033-IWTP360-005	033-IWTP360-009	033-IWTP360-031
	033-IWTP360-007	033-IWTP360-011	033-IWTP360-032
	033-IWTP360-008		
• Zinc in samples	033-IWTP360-005	033-IWTP360-008	033-IWTP360-031
	033-IWTP360-006	033-IWTP360-011	033-IWTP360-032
• Molybdenum in samples	033-IWTP360-005	033-IWTP360-031	033-IWTP360-013
	033-IWTP360-006	033-IWTP360-032	033-IWTP360-015
	033-IWTP360-011	033-IWTP360-002	

The following metals were detected in the associated calibration and method blanks at the concentrations noted below.

Analyte	Blank ID	Concentration
Aluminum	ICB/CCB	15.31 ug/L
Antimony	ICB/CCB	364 ug/L
Arsenic	ICB/CCB	-2.88 ug/L
Barium	ICB/CCB	5.09 ug/L
Cadmium	ICB/CCB	1.17 ug/L
Chromium	ICB/CCB	0.45 ug/L
Cobalt	ICB/CCB	1.86 ug/L
Copper	PBS	0.065 mg/Kg
Copper	PBW	3.6 ug/L
Copper	ICB/CCB	8.34 ug/L
Iron	ICB/CCB	11.74 ug/L
Lead	ICB/CCB	1.98 ug/L
Manganese	PBS	0.022 mg/Kg
Manganese	ICB/CCB	2.70 ug/L
Mercury	PBS	0.0061 mg/Kg
Mercury	PBW	0.023 ug/L
Mercury	ICB/CCB	0.03 ug/L
Nickel	ICB/CCB	1.78 ug/L
Selenium	ICB/CCB	-6.16 ug/L
Silver	PBS	0.036 mg/Kg
Silver	ICB/CCB	1.49 ug/L
Vanadium	ICB/CCB	1.86 ug/L
Zinc	ICB/CCB	2.80 ug/L
Molybdenum	ICB/CCB	2.83 ug/L

Detected results less than 5x the maximum blank contamination were qualified.

B. No field blank samples were identified in this SDG.

IV. Matrix Spike (MS)

A. The MS/MSD analysis was performed on samples 033-IWTP360-001, 033-IWTP360-019, and 033-IWTP360-020 and a non-client sample for all metals. Percent recoveries (%R) were within the 75-125% QC limits and the relative percent differences were within the QC limits of ≤20 for waters and ≤35 for soils.

V. Matrix Duplicate (DUP)

A. The DUP analysis was performed on samples 033-IWTP360-001, 033-IWTP360-019, and 033-IWTP360-020 and a non-client sample for all metals. Relative percent differences (RPD) were within the QC limits of ≤20 for waters and ≤35 for soils.

VI. Laboratory Control Sample (LCS)

A. The LCS QC samples were analyzed as required under the TTEMI SOW. The percent recoveries (%R) were within the QC limits.

VII. ICP Serial Dilution

A. Samples 033-IWTP360-019 and 033-IWTP360-020* were used for the ICP serial dilution analysis.

B. Due to ICP serial dilution problems, the following detected results are qualified as estimated (Jh).

• Potassium in samples	033-IWTP360-005	033-IWTP360-008	033-IWTP360-031
	033-IWTP360-006	033-IWTP360-009	033-IWTP360-032
	033-IWTP360-007	033-IWTP360-011	

The percent difference between the original sample result and the serial dilution result was outside the QC limits of 10% for analyte concentrations greater than 50x the IDL as shown below.

Sample ID	Analyte	Original Concentration	50x IDL	%D
033-IWTP360-020*	Potassium	4214.46 ug/L	550 ug/L	12.5

VIII. Field Duplicate

A. No field duplicate samples were identified in this SDG.

IX. Other Qualifications

A. The following results are qualified as estimated (Jg).

- All metals results above the IDL but below the RL.

Results above the IDL but below the RL are considered qualitatively acceptable but quantitatively unreliable due to uncertainties in the analytical precision near the limit of detection.

OVERALL ASSESSMENT OF DATA

I. Method Compliance and Additional Comments

A. All analyses were conducted within all specifications of the requested methods.

II. Usability

Metals Analysis

A. No results for metals analysis were rejected in this SDG.

B. Due to instrument calibration, calibration and method blank contamination, and ICP serial dilution problems in the metals analysis, several samples were qualified as estimated. The findings were as follows:

- Due to CRDL standard recovery problems, Copper detected results were qualified as estimated in nineteen samples.
- Due to method and calibration blank problems, Aluminum, Arsenic, and Vanadium were qualified as nondetect in seven samples, Antimony and Molybdenum were qualified nondetect in eight samples, Barium, Chromium, and Manganese were qualified nondetect in two samples, Cadmium was qualified as nondetect in thirteen samples, Cobalt, Lead, Nickel, and Silver were qualified as nondetect in five samples, Copper was qualified as nondetect in eleven samples, Iron was qualified as nondetect in three samples, Mercury was qualified as nondetect in twelve samples, Selenium was qualified as nondetect in one sample, and Zinc was qualified as nondetect in six samples.
- Due to ICP serial dilution %D problems, Potassium detected results were qualified as estimated in eight samples.
- All detected results reported above the IDL but below the RL were qualified as estimated.

C. No samples were reextracted or reanalyzed for metals analysis in this SDG.

III. The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the cursory and full data validation all other results are considered valid and usable for all purposes.

Final EDD Tables

PERCENT MOISTURE ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

Matrix : SOIL

Date: 06/02/04

TtEMI Sample ID / Units	033-IWTP360-001 (%MST)			033-IWTP360-002 (%MST)			033-IWTP360-003 (%MST)			033-IWTP360-004 (%MST)			033-IWTP360-012 (%MST)		
Sample Location	IWTP360-DP01-SO-2			IWTP360-DP01-SO-8			IWTP360-DP02-SO-2			IWTP360-DP02-SO-8			IWTP360-VE01-SO-3		
Sample Depth (ft)	1.50 - 2.00			4.50 - 5.00			1.50 - 2.00			4.50 - 5.00			3.00 - 3.50		
Date Sampled / SDG Number	03/03/04 AVP02			03/03/04 AVP02			03/03/04 AVP02			03/03/04 AVP02			03/04/04 AVP02		
Date Extracted / Analyzed	03/10/04 03/10/04			03/10/04 03/10/04			03/10/04 03/10/04			03/10/04 03/10/04			03/10/04 03/10/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
MOISTURE	10.7			10.9			7.8			12.5			7.0		

TtEMI Sample ID / Units	033-IWTP360-013 (%MST)			033-IWTP360-015 (%MST)			033-IWTP360-018 (%MST)			033-IWTP360-021 (%MST)			033-IWTP360-022 (%MST)		
Sample Location	IWTP360-VE01-SO-5			IWTP360-VE02-SO-3			IWTP360-VE03-SO-3			IWTP360-VE04-SO-3			IWTP360-VE04-SO-5		
Sample Depth (ft)	4.00 - 4.50			3.00 - 3.50			2.00 - 2.50			3.00 - 3.50			4.00 - 4.50		
Date Sampled / SDG Number	03/04/04 AVP02			03/04/04 AVP02			03/04/04 AVP02			03/04/04 AVP02			03/04/04 AVP02		
Date Extracted / Analyzed	03/10/04 03/10/04			03/10/04 03/10/04			03/10/04 03/10/04			03/10/04 03/10/04			03/10/04 03/10/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
MOISTURE	10.8			6.2			7.9			6.6			9.6		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

PERCENT MOISTURE ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

Matrix : SOIL

TtEMI Sample ID / Units	033-IWTP360-034 (%)		
Sample Location	IWTP360-DP05-SO-2		
Sample Depth (ft)	1.50 - 2.00		
Date Sampled / SDG Number	03/05/04 AVP02		
Date Extracted / Analyzed	04/01/04 04/01/04		
Analyte	Result	Val	Com
MOISTURE, PERCENT	6		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration
NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

Note :

METALS (TOTAL) ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

Matrix : SOIL

Date: 06/02/04

TtEMI Sample ID / Units	033-IWTP360-001 (MG/KG)			033-IWTP360-002 (MG/KG)			033-IWTP360-003 (MG/KG)			033-IWTP360-004 (MG/KG)			033-IWTP360-012 (MG/KG)		
Sample Location	IWTP360-DP01-SO-2			IWTP360-DP01-SO-8			IWTP360-DP02-SO-2			IWTP360-DP02-SO-8			IWTP360-VE01-SO-3		
Sample Depth (ft)	1.50 - 2.00			4.50 - 5.00			1.50 - 2.00			4.50 - 5.00			3.00 - 3.50		
Date Sampled / SDG Number	03/03/04 AVP02			03/03/04 AVP02			03/03/04 AVP02			03/03/04 AVP02			03/04/04 AVP02		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
ALUMINUM	5190			5340			4420			4310			4930		
ANTIMONY	0.49	U		0.49	U		0.48	U		0.50	U		0.47	U	
ARSENIC	1.7	UJ	b	15.5			1.4	UJ	b	1.2	UJ	b	1.9	UJ	b
BARIUM	48.4			92.4			38.4			52.1			52.8		
BERYLLIUM	0.029	U		0.029	U		0.028	U		0.030	U		0.028	U	
CADMIUM	0.054	U		0.24	UJ	b	0.052	U		0.088	UJ	b	18.9		
CALCIUM	3000			10000			5130			3020			4830		
CHROMIUM	42.7			35.8			34.9			36.9			44.9		
COBALT	5.7			10.2			5.1			5.1			5.9		
COPPER	8.3	UJ	b,f	56.6	J	f	5.3	UJ	b,f	6.9	UJ	b,f	11.4	J	f
IRON	10300			28800			8350			9110			8940		
LEAD	5.0			215			2.6			4.8			25.8		
MAGNESIUM	2550			3190			2380			2660			2490		
MANGANESE	117			288			103			154			138		
MERCURY	0.040	UJ	b	0.11	J	g	0.025	UJ	b	0.018	UJ	b	0.058	J	g
MOLYBDENUM	0.13	U		0.81	UJ	b	0.12	U		0.13	U		0.12	U	
NICKEL	27.6			47.3			24.8			27.4			130		
POTASSIUM	396			452			368			427			367		
SELENIUM	0.58	U		0.58	U		0.56	U		0.59	U		0.56	U	
SILVER	0.13	U		0.13	U		0.12	U		0.13	U		0.12	U	
SODIUM	34	U		34	U		33	U		35	U		32	U	
THALLIUM	0.43	U		0.43	U		0.41	U		0.43	U		0.41	U	
VANADIUM	21.9			32.1			20.4			19.6			20.5		
ZINC	21.6			101			16.3			21.7			38.5		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

METALS (TOTAL) ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

Matrix : SOIL

Date: 06/02/04

TtEMI Sample ID / Units	033-IWTP360-013 (MG/KG)			033-IWTP360-015 (MG/KG)			033-IWTP360-018 (MG/KG)			033-IWTP360-021 (MG/KG)			033-IWTP360-022 (MG/KG)		
Sample Location	IWTP360-VE01-SO-5			IWTP360-VE02-SO-3			IWTP360-VE03-SO-3			IWTP360-VE04-SO-3			IWTP360-VE04-SO-5		
Sample Depth (ft)	4.00 - 4.50			3.00 - 3.50			2.00 - 2.50			3.00 - 3.50			4.00 - 4.50		
Date Sampled / SDG Number	03/04/04 AVP02			03/04/04 AVP02			03/04/04 AVP02			03/04/04 AVP02			03/04/04 AVP02		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
ALUMINUM	4930			4190			5430			5090			5620		
ANTIMONY	0.49	U		0.47	U		0.48	U		0.47	U		0.49	U	
ARSENIC	1.4	UJ	b	3.4			3.8			2.3	UJ	b	4.0		
BARIUM	42.7			64.5			59.6			58.7			74.1		
BERYLLIUM	0.029	U		0.028	U		0.028	U		0.028	U		0.029	U	
CADMIUM	17.0			0.30	UJ	b	0.096	UJ	b	0.41	UJ	b	1.1	UJ	b
CALCIUM	15300			3570			5460			18200			26300		
CHROMIUM	129			30.4			32.4			35.1			83.0		
COBALT	5.5			5.5			5.7			5.2			5.6		
COPPER	12.6	J	f	22.0	J	f	9.7	J	f	10.6	J	f	34.6	J	f
IRON	9260			13300			11200			9280			14900		
LEAD	18.8			8.6			8.1			17.1			54.0		
MAGNESIUM	2620			2500			2800			2720			3820		
MANGANESE	121			137			149			127			192		
MERCURY	0.060	J	g	0.0034	U		0.040	UJ	b	0.059	J	g	0.11		
MOLYBDENUM	0.14	UJ	b	0.38	UJ	b	0.12	U		0.12	U		3.1		
NICKEL	184			28.0			26.0			24.1			34.5		
POTASSIUM	381			440			436			468			476		
SELENIUM	0.58	U		0.55	U		0.56	U		0.56	U		0.58	U	
SILVER	1.1	UJ	b	0.12	U		0.12	U		0.12	U		4.2		
SODIUM	34	U		32	U		33	U		32	U		33	U	
THALLIUM	0.43	U		0.40	U		0.41	U		0.41	U		0.42	U	
VANADIUM	21.8			19.6			21.9			22.5			24.0		
ZINC	30.7			27.1			27.3			25.7			73.3		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

METALS (TOTAL) ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

Matrix : SOIL

Date: 06/02/04

TtEMI Sample ID / Units	033-IWTP360-034 (MG/KG)		
Sample Location	IWTP360-DP05-SO-2		
Sample Depth (ft)	1.50 - 2.00		
Date Sampled / SDG Number	03/05/04 AVP02		
Analyte	Result	Val	Com
ALUMINUM	4860		
ANTIMONY	0.78	UJ	b
ARSENIC	2.0	UJ	b
BARIUM	53.8		
BERYLLIUM	0.028	U	
CADMIUM	0.22	UJ	b
CALCIUM	5390		
CHROMIUM	32.8		
COBALT	5.5		
COPPER	11.8	J	f
IRON	9380		
LEAD	9.7		
MAGNESIUM	2580		
MANGANESE	120		
MERCURY	0.047	J	g
MOLYBDENUM	0.12	U	
NICKEL	28.2		
POTASSIUM	421		
SELENIUM	0.55	U	
SILVER	0.12	U	
SODIUM	32	U	
THALLIUM	0.40	U	
VANADIUM	21.5		
ZINC	26.4		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

METALS (TOTAL) ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

Matrix : WATER

Date: 06/02/04

TtEMI Sample ID / Units	033-IWTP360-005 (UG/L)			033-IWTP360-006 (UG/L)			033-IWTP360-007 (UG/L)			033-IWTP360-008 (UG/L)			033-IWTP360-009 (UG/L)		
Sample Location	IWTP360-DP02-GW-7			IWTP360-DP02-GW-12			IWTP360-DP03-GW-7			IWTP360-DP03-GW-12			IWTP360-DP04-GW-7		
Sample Depth (ft)	4.50 - 4.50			11.00 - 11.00			5.50 - 5.50			10.50 - 10.50			6.00 - 6.00		
Date Sampled / SDG Number	03/04/04 AVP02			03/04/04 AVP02			03/03/04 AVP02			03/03/04 AVP02			03/03/04 AVP02		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
ALUMINUM	36.1	UJ	b	23.7	UJ	b	3150			24.9	UJ	b	23.2	UJ	b
ANTIMONY	5.0	UJ	b	3.5	UJ	b	6.6	UJ	b	3.0	UJ	b	6.8	UJ	b
ARSENIC	2.3	U		31.9			2.3	U		20.4			41.1		
BARIUM	74.2			128			58.7			124			194		
BERYLLIUM	0.13	U		0.13	U		0.13	U		0.13	U		0.13	U	
CADMIUM	0.38	UJ	b	0.41	UJ	b	0.63	UJ	b	1.4	UJ	b	0.42	UJ	b
CALCIUM	90800			82900			66700			56800			93300		
CHROMIUM	4.1	J	g	2.3	J	g	35.6			3.5	J	g	2.5	J	g
COBALT	0.27	U		0.64	UJ	b	2.8	UJ	b	1.6	UJ	b	2.5	UJ	b
COPPER	14.0	UJ	b,f	4.9	UJ	b,f	18.3	UJ	b,f	16.2	UJ	b,f	8.8	UJ	b,f
IRON	83.7			1680			3980			54.1	UJ	b	2620		
LEAD	1.2	U		1.4	UJ	b	3.5	UJ	b	5.9	UJ	b	1.7	UJ	b
MAGNESIUM	18300			22000			17800			12400			29100		
MANGANESE	82.6			2070			83.6			338			504		
MERCURY	0.050	UJ	b	0.060	UJ	b	0.042	UJ	b	0.046	UJ	b	0.046	UJ	b
MOLYBDENUM	10.9	UJ	b	12.3	UJ	b	22.3			42.0			21.5		
NICKEL	4.3	UJ	b	4.1	UJ	b	15.9			13.8			17.8		
POTASSIUM	9530	J	h	9960	J	h	1890	J	h	5210	J	h	11200	J	h
SELENIUM	2.6	U		2.6	U		3.2	UJ	b	2.6	U		2.6	U	
SILVER	0.56	U		1.2	UJ	b	0.56	U		1.0	UJ	b	0.56	U	
SODIUM	30300			89100			63000			89800			94200		
THALLIUM	1.9	U		1.9	U		1.9	U		1.9	U		1.9	U	
VANADIUM	5.6	UJ	b	0.74	J	g	11.5	UJ	b	5.1	UJ	b	2.1	UJ	b
ZINC	9.9	UJ	b	9.4	UJ	b	26.1			10.9	UJ	b	31.0		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

METALS (TOTAL) ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

Matrix : WATER

Date: 06/02/04

TtEMI Sample ID / Units	033-IWTP360-011 (UG/L)			033-IWTP360-031 (UG/L)			033-IWTP360-032 (UG/L)		
Sample Location	IWTP360-DP04-GW-7DUP			SOURCE BLANK			EQUIPMENT RINSATE		
Sample Depth (ft)	6.00 - 6.00			0.00 - 0.00			0.00 - 0.00		
Date Sampled / SDG Number	03/03/04 AVP02			03/04/04 AVP02			03/04/04 AVP02		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com
ALUMINUM	20.4	UJ	b	24.3	UJ	b	16.4	UJ	b
ANTIMONY	4.8	UJ	b	2.2	U		2.8	UJ	b
ARSENIC	39.8			2.3	U		2.3	U	
BARIUM	194			17.2	UJ	b	16.8	UJ	b
BERYLLIUM	0.13	U		0.13	U		0.13	U	
CADMIUM	0.36	UJ	b	0.23	U		0.23	U	
CALCIUM	92500			8200			7920		
CHROMIUM	2.8	J	g	0.42	UJ	b	0.99	UJ	b
COBALT	1.8	UJ	b	0.27	U		0.27	U	
COPPER	8.2	UJ	b,f	10	UJ	b,f	10.7	UJ	b,f
IRON	1610			46.3	UJ	b	58.6	UJ	b
LEAD	2.0	UJ	b	1.2	U		1.2	U	
MAGNESIUM	30800			1960			1850		
MANGANESE	371			3.8	UJ	b	6.6	UJ	b
MERCURY	0.048	UJ	b	0.042	UJ	b	0.069	UJ	b
MOLYBDENUM	10.6	UJ	b	1.2	UJ	b	1.9	UJ	b
NICKEL	6.3	UJ	b	0.52	UJ	b	0.68	UJ	b
POTASSIUM	11600	J	h	622	J	h	573	J	h
SELENIUM	2.6	U		2.6	U		2.6	U	
SILVER	0.56	U		0.65	UJ	b	1.2	UJ	b
SODIUM	97400			7650			7310		
THALLIUM	1.9	U		1.9	U		1.9	U	
VANADIUM	2.0	UJ	b	0.44	UJ	b	0.50	UJ	b
ZINC	8.1	UJ	b	8.0	UJ	b	10.7	UJ	b

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

Chain of Custody
and
Technical Review Checklist

Tetra Tech EM Inc.

CHAIN OF CUSTODY RECORD

10670 White Rock Road, Suite 100
Rancho Cordova, CA 95670
(916) 852-8300 FAX (916) 852-0307

DATE: 3/3/04
CHAIN OF CUSTODY NUMBER: No. 6231
LABORATORY NUMBER: 042185
PAGE 1 OF 3

PROJECT NAME: IWTP360 Conf.	PROJECT MANAGER: Glynis Foulk
PROJECT NUMBER: G9016033OS02	TELEPHONE NUMBER: 916-852-8300
PROJECT LOCATION: Alameda Point	DESTINATION LABORATORY: APCL
SAMPLER(S): B. Shelton	ADDRESS: 13760 Magnolia Ave
SAMPLER SIGNATURE(S): Brad Shelton	CITY: Chino STATE: CA ZIP: 91710
SITE CONTACT/TELEPHONE NUMBER: " 916-853-4559	LABORATORY TELEPHONE NUMBER: 909-590-1828

REQUESTED ANALYSES

SAMPLE IDENTIFICATION	DATE	TIME	MATRIX TYPE	NO./TYPE OF CONTAINERS	TURN AROUND TIME	CLP Metals	Molybdenum									REMARKS (GRAB, COMPOSITE, ETC.)
033-IWTP360-001	3/3	930	soil	1-9oz jar	standard	X	X									
033-IWTP360-002	3/3	1015	soil	1-9oz jar	standard	X	X									
033-IWTP360-007	3/3	1330	water	2-500mL	standard	X	X									HNO_3
033-IWTP360-008	3/3	1415	water	2-500mL	standard	X	X									
033-IWTP360-009	3/3	1445	water	2-500mL	standard	X	X									
033-IWTP360-011	3/3	1500	water	2-500mL	standard	X	X									
033-IWTP360-003	3/3	1650	soil	1-9oz jar	standard	X	X									
033-IWTP360-004	3/3	1700	soil	1-9oz jar	standard	X	X									
033-IWTP360-031	3/4	940	water	1-1liter	Standard	X	X									HNO_3
033-IWTP360-032	3/4	945	water	1-liter	standard	X	X									
033-IWTP360-012	3/4	1020	soil	1-8oz jar	standard	X	X									~~↓~~ BS

1989

SHIPPED VIA: Fedex AIRBILL #:

SPECIAL INSTRUCTIONS:

RELINQUISHED BY (SIGNATURE)	PRINT NAME/COMPANY	DATE	TIME	RECEIVED BY (SIGNATURE)	PRINT NAME/COMPANY	DATE	TIME
				[signature]	Jason Nario / APCL	3/9/04	1000

RECEIVED AT LAB BY (PRINT AND SIGN):

DISTRIBUTION: WHITE = LABORATORY YELLOW = PROJECT MANAGER PINK = FILE

Tetra Tech EM Inc.

CHAIN OF CUSTODY RECORD

10670 White Rock Road, Suite 100
Rancho Cordova, CA 95670
(916) 852-8300 FAX (916) 852-8307

DATE: 3/4/04
CHAIN OF CUSTODY NUMBER: № 6233
LABORATORY NUMBER: 042185
PAGE 2 OF 3

PROJECT NAME: IWTP360 Conf Samp	PROJECT MANAGER: Glynis Foulk
PROJECT NUMBER: G9016033 0502	TELEPHONE NUMBER: 916-852-8300
PROJECT LOCATION: Alameda Point	DESTINATION LABORATORY: APCL
SAMPLER(S): B. Shelton	ADDRESS: 13760 Magnolia Ave
SAMPLER SIGNATURE(S): Brad Shelton	CITY: Chino STATE: CA ZIP: 91710
SITE CONTACT/TELEPHONE NUMBER: " 916-853-4559	LABORATORY TELEPHONE NUMBER: 909-590-1828

REQUESTED ANALYSES

SAMPLE IDENTIFICATION	DATE	TIME	MATRIX TYPE	NO./TYPE OF CONTAINERS	TURN AROUND TIME	CLP Metals	Molybdenum								REMARKS (GRAB, COMPOSITE, ETC.)
033-IWTP360-005	3/4	1005	water	1-1 liter	standard	X	X								HNO_3
033-IWTP360-013	3/4	1100	soil	1-8oz jar	standard	X	X								
033-IWTP360-015	3/4	1200	soil	1-8oz jar	standard	X	X								
033-IWTP360-006	3/4	1135	water	1-1 liter	standard	X	X								HNO_3
~~033-IWTP360-010~~	~~3/4~~		~~water~~	~~250 mL~~	~~standard~~	X	X								
033-IWTP360-018	3/4	1455	soil	1-8oz jar	standard	X	X								
033-IWTP360-021	3/4	1530	soil	1-8oz jar	standard	X	X								
033-IWTP360-022	3/4	1611	soil	1-8oz jar	standard	X	X								
~~033-IWTP360-023~~	~~3/4~~		~~water~~	~~1 liter~~	~~standard~~	X	X								
033-IWTP360-023	3/5		water	1 liter	standard	X	X								HNO_3
033-IWTP360-034	3/5	915	soil	1-8oz jar	standard	X	X								

1989

AVP01

SHIPPED VIA: Fedex
AIRBILL #:

SPECIAL INSTRUCTIONS:

RELINQUISHED BY (SIGNATURE)	PRINT NAME/ COMPANY	DATE	TIME	RECEIVED BY (SIGNATURE)	PRINT NAME/ COMPANY	DATE	TIME
				[signature]	Jason Nario/APCL	3/9/04	1000
				RECEIVED AT LAB BY (PRINT AND SIGN):			

DISTRIBUTION: WHITE = LABORATORY YELLOW = PROJECT MANAGER PINK = FILE

DATA VALIDATION REPORT
Technical Reviewer's QC Checklist

SDG Number: AVP02

- [x] Copies of chain-of-custodies are present for all samples in the sample delivery group (SDG).
- [x] All samples in the SDG are listed in the analytical summary table and all the requested analyses are accurately tabulated.
- [x] All QC samples are identified on the tables such as equipment rinsates, field blanks, trip blanks, MS/MSD, and field duplicates.
- [x] Analytical result sheets or electronic deliverable data results are present for all samples and analyses identified on the analytical summary table.
- [x] Each analytical result with a qualifier has a comment code associated with it.
- [x] The MS/MSD and field duplicate samples that are discussed in the narrative match those identified on the analytical summary table.
- [x] Dilutions have been discussed in the narrative for all samples with elevated reporting limits.
- [x] The Overall Assessment in each section is thorough and mentions all issues where a problem arose. Field QC samples such as equipment rinsates, field blanks, and trip blanks are also discussed.
- [x] All qualifiers on the data tables are accounted for in the narrative.
- [ ]

PROGRESS CHECKLIST

- [x] Technical Review Completed
- [x] Review Comments Incorporated
- [ ] Missing items needed for completeness:______________________

- [x] Ready for binding and doctrack!

dvtrchk.plt

John Swaupm 6-2-04

Technical Review Addendum

To Validation Report

For SDG # AVP 03

Technical Review Addendum
to
Validation Report

DATA VALIDATION REPORT ADDENDUM
MODIFICATION TO THE REPORT
AVP03

Prepared by:	John Swanson, Tetra Tech EM, Inc.
Date:	6/3/04
Site Name/Job Number:	Alameda/G9016.033.05.02
Laboratory:	Applied Physics and Chemistry Laboratory (APCL), Chino, California
Data Validation Firm:	Laboratory Data Consultants, Inc.

There were no modifications to the validation report.

Data Validation Report

DATA VALIDATION REPORT

Site:	NAS Alameda Point
Contract Task Order (CTO) No.:	G91060330502
Laboratory:	Applied P & Ch Laboratory
Data Reviewer:	Richard Amano, Stacey Swenson, Ming Hwang, and Steve Ziliak.
Firm/Proj. No:	Laboratory Data Consultants, Inc./11991C
Review Date:	May 24, 2004
Sample Delivery Group (SDG) No.:	AVP03

Sample Nos.: 033-IWTP360-024 033-IWTP360-024MSD 033-IWTP360-024DUP
033-IWTP360-024MS

* Full Validation Sample

Matrix: Soil and Water

Collection Date(s): March 5, 2004

The data were qualified according to the U.S. Environmental Protection Agency (EPA) documents "USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Data Review" (February 1994). In addition, the Tetra Tech EMI, Inc. documents "Data Validation Guidelines for CLP Inorganic Analyses" (March 1997), and the document entitled "PRC Comprehensive Long-term Environmental Action Navy II Analytical Services Statement of Work" (September 1998) were used along with other specified criteria in EPA methods. Data validation requirements are presented below.

I certify that all data validation criteria outlined in the above referenced documents were assessed, and any qualifications made to the data were in accordance with those documents.

Certified by Richard Amano
Principal Chemist

DATA VALIDATION REQUIREMENTS

Full validation includes all parameters listed below. Cursory validation parameters are indicated by an asterisk (*).

CLP Organic Parameters

*	Holding times
	GC/MS instrument performance check
*	Initial and continuing calibrations
*	Blanks
*	Surrogate recovery
*	Matrix spike/matrix spike duplicate
*	Laboratory control sample or blank spike
*	Field duplicates
*	Internal standard performance
	Target compound identification
	Tentatively identified compounds
	Compound quantitation
	Reported detection limits
	System performance
*	Overall assessment of data for the SDG

CLP Inorganic Parameters

*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
	ICP interference check sample
	GFAA quality control
*	ICP serial dilution
	Sample result verification
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

Non-CLP Organic and Inorganic Parameters

*	Method compliance
*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike/matrix spike duplicate
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
*	Surrogate recovery
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

DATA VALIDATION QUALIFIERS AND CODES

Data Validation Qualifiers

UJ	Estimated nondetected result
J	Estimated detected result
R	Rejected result
NJ	Tentatively Identified Compound (TIC)

Data Validation Qualifier Codes

a	Surrogate recovery exceedance
b	Laboratory method blank and common blank contamination, Field blank contamination
c	Matrix spike/Matrix spike duplicates recovery exceedance
d	Duplicate precision exceedance
e	Internal standard exceedance
f	Calibration exceedance
g	Quantification below reporting limit
h	Other qualifications

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP AVP03

Sample ID	Matrix	Date Collected	Quality Control ID	Validation Criteria*	Analyses						
					METALS						
033-IWTP360-024	Soil	3/5/04	MS/MSD/DUP		X						

* = Cursory validation performed on all samples
*** = Full review performed on indicated parameters only
MS/MSD = Matrix Spike/Matrix Spike Duplicate
** = MS/MSD/DUP performed on indicated parameters only
DUP = Matrix duplicate

DATA ASSESSMENT

METALS ANALYSIS (EPA SW 846 Methods 6010B and 7000)

I. Holding Times

A. The 6 month and 28 day holding time requirements were met for TAL Metals and Mercury, respectively.

II. Calibrations

A. All instruments were calibrated daily and the proper number of standards were used in accordance with the SW 846 methods.

B. All initial and continuing calibration verifications (ICV and CCV) recoveries were within the 90-110% QC Limits (80-120% for Mercury). CRDL Standards for ICP and AA were analyzed with each analytical run and recoveries were within the ≥75% QC limits with the exception listed below.

C. Due to calibration problems, the following detected results are estimated (Jf).

- Arsenic in samples 033-IWTP360-024

The CRDL (3/30/04 10:45) percent recovery for Arsenic was 125.8%, outside the control limits of 75-125%.

The CRDL (3/30/04 10:45) percent recovery for Selenium was 125.5%, outside the control limits of 75-125%. Although the percent recovery demonstrates a high bias, the associated sample results were nondetected and therefore were not qualified.

D. The Interelement Correction Factor (IEC) was performed annually and the Instrument Detection Limit (IDL) and Linear Range Analysis (LRA) were analyzed quarterly.

III. Blank Contamination

A. Due to calibration and method blank contamination, the following results are considered nondetected (UJb).

- Arsenic and Molybdenum in sample 033-IWTP360-024

The following metals were detected in the associated calibration and method blanks at the concentrations noted below.

Analyte	Blank ID	Concentration
Arsenic	ICB/CCB	3.47 ug/L
Molybdenum	ICB/CCB	1.24 ug/L

Detected results less than 5x the maximum blank contamination were qualified.

B. No field blank samples were identified in this SDG.

IV. Matrix Spike (MS)

A. The MS/MSD analysis was performed on sample 033-IWTP360-024 and a non-client sample for all metals. Percent recoveries (%R) were within the 75-125% QC limits and the relative percent differences were within the QC limits of ≤35 for soils.

V. Matrix Duplicate (DUP)

A. The DUP analysis was performed on sample 033-IWTP360-024 and a non-client sample for all metals. Relative percent differences (RPD) were within the QC limits of ≤35 for soils.

VI. Laboratory Control Sample (LCS)

A. The LCS QC samples were analyzed as required under the TTEMI SOW. The percent recoveries (%R) were within the QC limits.

VII. ICP Serial Dilution

A. Sample 033-IWTP360-024 was used for the ICP serial dilution analysis.

B. Due to ICP serial dilution problems, the following detected results are qualified as estimated (Jh).

- Copper in sample 033-IWTP360-024

The percent difference between the original sample result and the serial dilution result was outside the QC limits of 10% for analyte concentrations greater than 50x the IDL as shown below.

Sample ID	Analyte	Original Concentration	50x IDL	%D
033-IWTP360-024	Copper	221.42 ug/L	50.0 ug/L	10.6

VIII. Field Duplicate

A. No field duplicate samples were identified in this SDG.

IX. Other Qualifications

A. The following results are qualified as estimated (Jg).

- All metals results above the IDL but below the RL.

Results above the IDL but below the RL are considered qualitatively acceptable but quantitatively unreliable due to uncertainties in the analytical precision near the limit of detection.

OVERALL ASSESSMENT OF DATA

I. Method Compliance and Additional Comments

A. All analyses were conducted within all specifications of the requested methods.

II. Usability

Metals Analysis

A. No results for metals analysis were rejected in this SDG.

B. Due to instrument calibration, calibration and method blank contamination, and ICP serial dilution problems in the metals analysis, several samples were qualified as estimated. The findings were as follows:

- Due to CRDL standard recovery problems, Arsenic detected results were qualified as estimated in one sample.
- Due to method and calibration blank problems, Arsenic and Molybdenum were qualified nondetect in one sample.
- Due to ICP serial dilution %D problems, Copper detected results were qualified as estimated in one sample.
- All detected results reported above the IDL but below the RL were qualified as estimated.

C. No samples were reextracted or reanalyzed for metals analysis in this SDG.

III. The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the cursory and full data validation all other results are considered valid and usable for all purposes.

Final EDD Tables

PERCENT MOISTURE ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

Matrix : SOIL

Date: 06/03/04

TtEMI Sample ID / Units	033-IWTP360-024 (%MST)		
Sample Location	IWTP360-VE05-SO-3		
Sample Depth (ft)	2.50 - 3.00		
Date Sampled / SDG Number	03/05/04 AVP03		
Date Extracted / Analyzed	03/25/04 03/25/04		
Analyte	Result	Val	Com
MOISTURE	10.5		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration
NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

Note :

Project : ALAMEDA DO 033
Laboratory : Applied Physics & Chemistry Laboratory

METALS (TOTAL) ANALYSIS

Matrix : SOIL

TtEMI Sample ID / Units	033-IWTP360-024 (MG/KG)		
Sample Location	IWTP360-VE05-SO-3		
Sample Depth (ft)	2.50 - 3.00		
Date Sampled / SDG Number	03/05/04 AVP03		
Analyte	Result	Val	Com
ALUMINUM	3390		
ANTIMONY	0.12	U	
ARSENIC	0.35	UJ	b
BARIUM	35.5		
BERYLLIUM	0.0073	U	
CADMIUM	9.2		
CALCIUM	3190		
CHROMIUM	205		
COBALT	4.4		
COPPER	12.4	J	h
IRON	6860		
LEAD	17.5		
MAGNESIUM	1880		
MANGANESE	89.7		
MERCURY	0.13	J	g
MOLYBDENUM	0.20	UJ	b
NICKEL	155		
POTASSIUM	317		
SELENIUM	0.15	U	
SILVER	1.1		
SODIUM	8.4	U	
THALLIUM	0.11	U	
VANADIUM	17.2		
ZINC	21.4		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
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y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

Chain of Custody
and
Technical Review Checklist

Curtis & Tompkins, Ltd.
Analytical Laboratory Since 1878
2323 Fifth Street
Berkeley, CA 94710
(510) 486-0900 Phone
(510) 486-0532 Fax

CHAIN OF CUSTODY

C & T LOGIN #: 171017

2239

Sampler:

Project No.:

Report To: JOHN SWANSON

Project Name:

Company: TETRA TECH

Project P.O.:

Telephone: 916 853 4582

Turnaround Time:

Fax:

Analysis

Lab No.	Sample ID.	Sampling Date Time	Matrix: Soil	Water	Waste		# of Containers	Preservative: HCL	H_2SO_4	HNO_3	ICE	NONE	Metals Analysis
-004	033-IWTP360-024	3/5/4 1145	X				1					✓	X

Notes: SHIPPED TO:
APCL
13760 Magnolia Ave
Chino, CA 91710
Attn: ERIC WENDLAND 9095901828

SAMPLE RECEIPT
☐ Intact ☐ Cold
☐ On Ice ☐ Ambient
Preservative Correct?
☐ Yes ☐ No ☐ N/A

RELINQUISHED BY:		RECEIVED BY:	
[signature]	3/24/04 1600 DATE / TIME	[signature]	3/25/04 1000 DATE / TIME
	DATE / TIME		DATE / TIME
	DATE / TIME		DATE / TIME

SIGNATURE

DATA VALIDATION REPORT
Technical Reviewer's QC Checklist

SDG Number: AVP03

- ☑ Copies of chain-of-custodies are present for all samples in the sample delivery group (SDG).
- ☑ All samples in the SDG are listed in the analytical summary table and all the requested analyses are accurately tabulated.
- ☑ All QC samples are identified on the tables such as equipment rinsates, field blanks, trip blanks, MS/MSD, and field duplicates.
- ☑ Analytical result sheets or electronic deliverable data results are present for all samples and analyses identified on the analytical summary table.
- ☑ Each analytical result with a qualifier has a comment code associated with it.
- ☑ The MS/MSD and field duplicate samples that are discussed in the narrative match those identified on the analytical summary table.
- ☑ Dilutions have been discussed in the narrative for all samples with elevated reporting limits.
- ☑ The Overall Assessment in each section is thorough and mentions all issues where a problem arose. Field QC samples such as equipment rinsates, field blanks, and trip blanks are also discussed.
- ☑ All qualifiers on the data tables are accounted for in the narrative.
- ☐

PROGRESS CHECKLIST

- ☑ Technical Review Completed
- ☑ Review Comments Incorporated
- ☐ Missing items needed for completeness:____________________

- ☑ Ready for binding and doctrack!

John Swanson 6-3-04

dvtrchk.plt

Technical Review Addendum

To Validation Report

For SDG # ABT 01

Technical Review Addendum
to
Validation Report

DATA VALIDATION REPORT ADDENDUM
MODIFICATION TO THE REPORT
ABT01

Prepared by:	John Swanson, Tetra Tech EM, Inc.
Date:	6/1/04
Site Name/Job Number:	Alameda/G9016.033.05.02
Laboratory:	Curtis & Tompkins, Ltd., Berkeley, California
Data Validation Firm:	Laboratory Data Consultants, Inc.

General Comments

1. The results provided by the laboratory in the electronic database format for soil samples were reported on a wet-weight basis. Results for the soil samples on a dry-weight basis were calculated and saved to the Tetra Tech EM Inc. database.

There were no other modifications to the validation report.

Data Validation Report

DATA VALIDATION REPORT

Site:	NAS Alameda Point
Contract Task Order (CTO) No.:	G91060330502
Laboratory:	Curtis & Tompkins, Ltd.
Data Reviewer:	Richard Amano, Stacey Swenson, Ming Hwang, and Steve Ziliak.
Firm/Proj. No:	Laboratory Data Consultants, Inc./11992A
Review Date:	May 25, 2004
Sample Delivery Group (SDG) No.:	ABT01

Sample Nos.:			
	033-IWTP360-003	033-IWTP360-013	033-IWTP360-022
	033-IWTP360-004	033-IWTP360-015	033-IWTP360-031MS
	033-IWTP360-031	033-IWTP360-006	033-IWTP360-031MSD
	033-IWTP360-032	033-IWTP360-018	033-IWTP360-004MS
	033-IWTP360-012	033-IWTP360-021	033-IWTP360-004MSD
	033-IWTP360-005		

* Full Validation Sample

Matrix: Soil and Water

Collection Date(s): March 3 through March 4, 2004

The data were qualified according to the U.S. Environmental Protection Agency (EPA) documents "USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Data Review" (February 1994). In addition, the Tetra Tech EMI, Inc. documents "Data Validation Guidelines for CLP Inorganic Analyses," "Data Validation Guidelines for Non-CLP Inorganic and Physical Analyses" (March 1997), and the document entitled "PRC Comprehensive Long-term Environmental Action Navy II Analytical Services Statement of Work" (September 1998) were used along with other specified criteria in EPA methods. Data validation requirements are presented below.

I certify that all data validation criteria outlined in the above referenced documents were assessed, and any qualifications made to the data were in accordance with those documents.

Certified by Richard Amano
Principal Chemist

DATA VALIDATION REQUIREMENTS

Full validation includes all parameters listed below. Cursory validation parameters are indicated by an asterisk (*).

CLP Organic Parameters

*	Holding times
	GC/MS instrument performance check
*	Initial and continuing calibrations
*	Blanks
*	Surrogate recovery
*	Matrix spike/matrix spike duplicate
*	Laboratory control sample or blank spike
*	Field duplicates
*	Internal standard performance
	Target compound identification
	Tentatively identified compounds
	Compound quantitation
	Reported detection limits
	System performance
*	Overall assessment of data for the SDG

CLP Inorganic Parameters

*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
	ICP interference check sample
	GFAA quality control
*	ICP serial dilution
	Sample result verification
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

Non-CLP Organic and Inorganic Parameters

*	Method compliance
*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike/matrix spike duplicate
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
*	Surrogate recovery
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

DATA VALIDATION QUALIFIERS AND CODES

Data Validation Qualifiers

UJ	Estimated nondetected result
J	Estimated detected result
R	Rejected result
NJ	Tentatively Identified Compound (TIC)

Data Validation Qualifier Codes

a	Surrogate recovery exceedance
b	Laboratory method blank and common blank contamination, Field blank contamination
c	Matrix spike/Matrix spike duplicates recovery exceedance
d	Duplicate precision exceedance
e	Internal standard exceedance
f	Calibration exceedance
g	Quantification below reporting limit
h	Other qualifications

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP ABT01

Sample ID	Matrix	Date Collected	Quality Control ID	Validation Criteria*	Analyses C R V I						
033-IWTP360-003	Soil	3/3/04			X						
033-IWTP360-004	Soil	3/3/04	MS/MSD		X						
033-IWTP360-031	Water	3/4/04	MS/MSD SOURCE BLANK		X						
033-IWTP360-032	Water	3/4/04	EQUIPMENT RINSATE		X						
033-IWTP360-012	Soil	3/4/04			X						
033-IWTP360-005	Water	3/4/04			X						
033-IWTP360-013	Soil	3/4/04	6-1-04		X						
033-IWTP360-015	Soil	3/4/04			X						
033-IWTP360-006	Water	3/4/04			X						
033-IWTP360-018	Soil	3/4/04			X						
033-IWTP360-021	Soil	3/4/04			X						
033-IWTP360-022	Soil	3/4/04			X						

* = Cursory validation performed on all samples
*** = Full review performed on indicated parameters only
CRVI = Hexavalent Chromium
MS/MSD = Matrix Spike/Matrix Spike Duplicate
** = MS/MSD/DUP performed on indicated parameters only
DUP = Matrix duplicate

ABT01.REP
5/25/2004

DATA ASSESSMENT

NON-CLP INORGANIC AND PHYSICAL ANALYSIS

The following non-CLP inorganic and physical parameter was analyzed for: Hexavalent Chromium (CRVI).

I. Holding Times

A. The 24 hour analysis holding time requirement for waters and the 30 day extraction and 7 day analysis holding times for soils for CRVI were met.

II. Calibrations

A. All instruments were calibrated daily and the proper number of standards were used as required by the method.

B. All Initial and Continuing calibration verification were performed at the proper frequency all QC limits were met.

III. Blank Contamination

A. No contaminant concentrations were found in the method blanks. No field blanks were identified in this SDG.

IV. Matrix Spike (MS)

A. The MS/MSD analysis was performed on samples 033-IWTP360-031 and 033-IWTP360-004. Percent recoveries (%R) were within the QC limits and relative percent differences (RPD) were within the ≤20% QC limits for inorganic analyses and the ≤10% QC limits for physical analyses.

V. Matrix Duplicate (DUP)

A. The DUP analysis was not performed for this SDG. Although this is a protocol violation, the associated MS/MSD relative percent differences (RPD) were within the QC limits and no data was qualified.

VI. Laboratory Control Sample (LCS)

A. The LCS QC samples were analyzed as required under the TTEMI SOW. The percent recoveries (%R) were within the QC limits.

VII. Field Duplicate

A. No field duplicate samples were identified in this SDG.

VIII. Other Qualifications

A. No results were reported below the RL.

OVERALL ASSESSMENT OF DATA

I. Method Compliance and Additional Comments

A. All analyses were conducted within all specifications of the requested methods with the exceptions listed below.

- For the non-CLP inorganic and physical analysis, the DUP analysis was not performed for this SDG. Although this is a protocol violation, the associated MS/MSD relative percent differences (RPDs) were within the QC limits and no data was qualified.

II. Usability

<u>**Non-CLP Inorganic and Physical Analysis**</u>

A. No results for non-CLP inorganic and physical analysis were rejected in this SDG.

B. No samples were reextracted or reanalyzed for non-CLP inorganic and physical analysis in this SDG.

III. The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Based upon the cursory and full data validation all other results are considered valid and usable for all purposes.

Final EDD Tables

HEXAVALENT CHROMIUM ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Curtis and Tompkins Ltd.

Matrix : SOIL

Page: 1
Date: 06/01/04

TtEMI Sample ID / Units	033-IWTP360-003 (MG/KG)			033-IWTP360-004 (MG/KG)			033-IWTP360-012 (MG/KG)			033-IWTP360-013 (MG/KG)			033-IWTP360-015 (MG/KG)		
Sample Location	IWTP360-DP02-SO-2			IWTP360-DP02-SO-8			IWTP360-VE01-SO-3			IWTP360-VE01-SO-5			IWTP360-VE02-SO-3		
Sample Depth (ft)	1.50 - 2.00			4.50 - 5.00			3.00 - 3.50			4.00 - 4.50			3.00 - 3.50		
Date Sampled / SDG Number	03/03/04 ABT01			03/03/04 ABT01			03/04/04 ABT01			03/04/04 ABT01			03/04/04 ABT01		
Date Extracted / Analyzed	03/09/04 03/09/04			03/09/04 03/09/04			03/09/04 03/09/04			03/09/04 03/09/04			03/09/04 03/09/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
HEXAVALENT CHROMIUM	0.06	U		0.06	U		0.09			0.39			0.06	U	

TtEMI Sample ID / Units	033-IWTP360-018 (MG/KG)			033-IWTP360-021 (MG/KG)			033-IWTP360-022 (MG/KG)		
Sample Location	IWTP360-VE03-SO-3			IWTP360-VE04-SO-3			IWTP360-VE04-SO-5		
Sample Depth (ft)	2.00 - 2.50			3.00 - 3.50			4.00 - 4.50		
Date Sampled / SDG Number	03/04/04 ABT01			03/04/04 ABT01			03/04/04 ABT01		
Date Extracted / Analyzed	03/09/04 03/09/04			03/09/04 03/09/04			03/09/04 03/09/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com
HEXAVALENT CHROMIUM	0.06	U		0.06			1.0		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

PERCENT MOISTURE FOR OTHER RESULTS ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Curtis and Tompkins Ltd.

Matrix : SOIL

Date: 06/01/04

TtEMI Sample ID / Units	033-IWTP360-003 (%)			033-IWTP360-004 (%)			033-IWTP360-012 (%)			033-IWTP360-013 (%)			033-IWTP360-015 (%)		
Sample Location	IWTP360-DP02-SO-2			IWTP360-DP02-SO-8			IWTP360-VE01-SO-3			IWTP360-VE01-SO-5			IWTP360-VE02-SO-3		
Sample Depth (ft)	1.50 - 2.00			4.50 - 5.00			3.00 - 3.50			4.00 - 4.50			3.00 - 3.50		
Date Sampled / SDG Number	03/03/04 ABT01			03/03/04 ABT01			03/04/04 ABT01			03/04/04 ABT01			03/04/04 ABT01		
Date Extracted / Analyzed	04/01/04 04/01/04			04/01/04 04/01/04			04/01/04 04/01/04			04/01/04 04/01/04			04/01/04 04/01/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
MOISTURE, PERCENT	23			13			8			10			6		

TtEMI Sample ID / Units	033-IWTP360-018 (%)			033-IWTP360-021 (%)			033-IWTP360-022 (%)		
Sample Location	IWTP360-VE03-SO-3			IWTP360-VE04-SO-3			IWTP360-VE04-SO-5		
Sample Depth (ft)	2.00 - 2.50			3.00 - 3.50			4.00 - 4.50		
Date Sampled / SDG Number	03/04/04 ABT01			03/04/04 ABT01			03/04/04 ABT01		
Date Extracted / Analyzed	04/01/04 04/01/04			04/01/04 04/01/04			04/01/04 04/01/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com
MOISTURE, PERCENT	9			7			8		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

HEXAVALENT CHROMIUM ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Curtis and Tompkins Ltd.

Matrix : WATER

Date: 06/01/04

TtEMI Sample ID / Units	033-IWTP360-005 (MG/L)			033-IWTP360-006 (MG/L)			033-IWTP360-031 (MG/L)			033-IWTP360-032 (MG/L)		
Sample Location	IWTP360-DP02-GW-7			IWTP360-DP02-GW-12			SOURCE BLANK			EQUIPMENT RINSATE		
Sample Depth (ft)	4.50 - 4.50			11.00 - 11.00			0.00 - 0.00			0.00 - 0.00		
Date Sampled / SDG Number	03/04/04 ABT01			03/04/04 ABT01			03/04/04 ABT01			03/04/04 ABT01		
Date Extracted / Analyzed	03/05/04 03/05/04			03/05/04 03/05/04			03/05/04 03/05/04			03/05/04 03/05/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
HEXAVALENT CHROMIUM	0.01	U		0.01	U		0.01	U		0.01	U	

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

Note :

Chain of Custody
and
Technical Review Checklist

170985

Tetra Tech EM Inc.

CHAIN OF CUSTODY RECORD

10670 White Rock Road, Suite 100
Rancho Cordova, CA 95670
(916) 852-8300 FAX (916) 852-8387

DATE 3/4/04	CHAIN OF CUSTODY NUMBER № 6236
LABORATORY NUMBER 042187	PAGE 1 OF 2

PROJECT NAME: IWTP360	PROJECT MANAGER: Glynis Foulk
PROJECT NUMBER: G90160330502	TELEPHONE NUMBER: 916-852-8300
PROJECT LOCATION: Alameda Point	DESTINATION LABORATORY: Curtis & Tompkins
SAMPLER(S): R. Shah	ADDRESS: 2323 Fifth Street
SAMPLER SIGNATURE(S): Ramesh N. Shah	CITY: Berkeley STATE: CA ZIP: 94710
SITE CONTACT/TELEPHONE NUMBER: Brad Shelton/916-225-3800	LABORATORY TELEPHONE NUMBER: 510-486-0900

REQUESTED ANALYSES

	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX TYPE	NO./TYPE OF CONTAINERS	TURN AROUND TIME	Hex Chromium										REMARKS (GRAB, COMPOSITE, ETC.)
-1	033-IWTP360-003	3/3	1630	soil	1 9oz jar	standard	X										
-2	033-IWTP360-004	3/3	1700	soil	1-9oz jar	standard	X										
-3	033-IWTP360-031	3/4	940	water	1-500mL	standard	X										
-4	033-IWTP360-032	3/4	945	water	1-500mL	standard	X										4
-5	033-IWTP360-012	3/4	1020	soil	1-8oz jar	standard	X										
-6	033-IWTP360-005	3/4	1005	water	1-500mL	standard	X										
-7	033-IWTP360-013	3/4	1100	soil	1-8oz jar	standard	X										
-8	033-IWTP360-015	3/4	1200	soil	1-8oz jar	standard	X										
-9	033-IWTP360-006	3/4	1135	water	1500mL	standard	X										
	~~033-IWTP360-010~~	~~3/4~~		~~water~~	~~1-500mL~~	~~standard~~	~~X~~										SB
-10	033-IWTP360-018	3/4	1455	soil	1-8oz jar	standard	X										

SHIPPED VIA: hand delivered AIRBILL #:

SPECIAL INSTRUCTIONS:

RELINQUISHED BY (SIGNATURE)	PRINT NAME/COMPANY	DATE	TIME	RECEIVED BY (SIGNATURE)	PRINT NAME/COMPANY	DATE	TIME
Brad Shelton	Brad Shelton/TTEMI	3/4/04	1805				
				RECEIVED AT LAB BY (PRINT AND SIGN): [signature] 3+		3/4/4	1805

DISTRIBUTION: WHITE = LABORATORY YELLOW = PROJECT MANAGER PINK = FILE

170985

CHAIN OF CUSTODY RECORD

Tetra Tech EM Inc.

10670 White Rock Road, Suite 100
Rancho Cordova, CA 95670
(916) 852-8300 FAX (916) 852-0307

DATE	CHAIN OF CUSTODY NUMBER
3/4/04	№ 6234
LABORATORY NUMBER 042187	PAGE 2 OF 2

PROJECT NAME: IWTP360	PROJECT MANAGER: Glynis Foulk
PROJECT NUMBER: G901603305O2	TELEPHONE NUMBER: 916-852-8300
PROJECT LOCATION: Alameda Point	DESTINATION LABORATORY: Curtis & Tompkins
SAMPLER(S): R Shah	ADDRESS: 2323 5th Street
SAMPLER SIGNATURE(S): Ramesh ? Shah	CITY: Berkeley STATE: CA ZIP: 94710
SITE CONTACT/TELEPHONE NUMBER: Brad Shelton / 916-225-3800	LABORATORY TELEPHONE NUMBER: 510-486-0900

REQUESTED ANALYSES: Hex Chromium

	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX TYPE	NO./TYPE OF CONTAINERS	TURN AROUND TIME	Hex Chromium										REMARKS (GRAB, COMPOSITE, ETC.)
-11	033-IWTP360-021	3/4	1530	soil	1-8oz jar	Standard	X										
-12	033-IWTP360-022	3/4	1611	soil	1-8oz jar	Standard	X										
	~~033-IWTP360-023~~	~~3/4~~		~~water~~	~~1-500mL~~	~~standard~~	~~X~~										SH

SHIPPED VIA: hand delivered AIRBILL #:

SPECIAL INSTRUCTIONS:

RELINQUISHED BY (SIGNATURE)	PRINT NAME/COMPANY	DATE	TIME	RECEIVED BY (SIGNATURE)	PRINT NAME/COMPANY	DATE	TIME
Brad Shelton	Brad Shelton/TTEMI	3/4/04	1805				
				RECEIVED AT LAB BY (PRINT AND SIGN): Anna Pajarillo		3/4/4	1805

DISTRIBUTION: WHITE = LABORATORY YELLOW = PROJECT MANAGER PINK = FILE

DATA VALIDATION REPORT
Technical Reviewer's QC Checklist

SDG Number: ABTØ1

- [x] Copies of chain-of-custodies are present for all samples in the sample delivery group (SDG).
- [x] All samples in the SDG are listed in the analytical summary table and all the requested analyses are accurately tabulated.
- [x] All QC samples are identified on the tables such as equipment rinsates, field blanks, trip blanks, MS/MSD, and field duplicates.
- [x] Analytical result sheets or electronic deliverable data results are present for all samples and analyses identified on the analytical summary table.
- [x] Each analytical result with a qualifier has a comment code associated with it.
- [x] The MS/MSD and field duplicate samples that are discussed in the narrative match those identified on the analytical summary table.
- [x] Dilutions have been discussed in the narrative for all samples with elevated reporting limits.
- [x] The Overall Assessment in each section is thorough and mentions all issues where a problem arose. Field QC samples such as equipment rinsates, field blanks, and trip blanks are also discussed.
- [x] All qualifiers on the data tables are accounted for in the narrative.
- [ ]

PROGRESS CHECKLIST

- [x] Technical Review Completed
- [x] Review Comments Incorporated
- [ ] Missing items needed for completeness:______________________________

- [x] Ready for binding and doctrack!

dvtrchk.plt

John Sweeper 6-1-Ø4

Technical Review Addendum

To Validation Report

For SDG # ABT 02

Technical Review Addendum
to
Validation Report

DATA VALIDATION REPORT ADDENDUM
MODIFICATION TO THE REPORT
ABT02

Prepared by:	John Swanson, Tetra Tech EM, Inc.
Date:	6/1/04
Site Name/Job Number:	Alameda/G9016.033.05.02
Laboratory:	Curtis & Tompkins, Ltd., Berkeley, California
Data Validation Firm:	Laboratory Data Consultants, Inc.

General Comments

1. The results provided by the laboratory in the electronic database format for soil samples were reported on a wet-weight basis. Results for the soil samples on a dry-weight basis were calculated and saved to the Tetra Tech EM Inc. database.

There were no other modifications to the validation report.

Data Validation Report

DATA VALIDATION REPORT

Site: NAS Alameda Point

Contract Task Order (CTO) No.: G91060330502

Laboratory: Curtis & Tompkins, Ltd.

Data Reviewer: Richard Amano, Stacey Swenson, Ming Hwang, and Steve Ziliak.

Firm/Proj. No: Laboratory Data Consultants, Inc./11993A

Review Date: May 25, 2004

Sample Delivery Group (SDG) No.: ABT02

Sample Nos.:

033-IWTP360-034	033-IWTP360-020*	033-IWTP360-030
033-IWTP360-035	033-IWTP360-027*	033-IWTP360-029
033-IWTP360-019	033-IWTP360-028	033-IWTP360-034MS
033-IWTP360-024	033-IWTP360-036	033-IWTP360-034MSD
033-IWTP360-025*	033-IWTP360-023*	

* Full Validation Sample

Matrix: Soil and Water

Collection Date(s): March 5, 2004

The data were qualified according to the U.S. Environmental Protection Agency (EPA) documents "USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Data Review" (February 1994). In addition, the Tetra Tech EMI, Inc. documents "Data Validation Guidelines for CLP Inorganic Analyses," "Data Validation Guidelines for Non-CLP Inorganic and Physical Analyses" (March 1997), and the document entitled "PRC Comprehensive Long-term Environmental Action Navy II Analytical Services Statement of Work" (September 1998) were used along with other specified criteria in EPA methods. Data validation requirements are presented below.

I certify that all data validation criteria outlined in the above referenced documents were assessed, and any qualifications made to the data were in accordance with those documents.

Certified by Richard Amano
Principal Chemist

DATA VALIDATION REQUIREMENTS

Full validation includes all parameters listed below. Cursory validation parameters are indicated by an asterisk (*).

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*	Holding times
	GC/MS instrument performance check
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*	Laboratory control sample or blank spike
*	Field duplicates
*	Internal standard performance
	Target compound identification
	Tentatively identified compounds
	Compound quantitation
	Reported detection limits
	System performance
*	Overall assessment of data for the SDG

CLP Inorganic Parameters

*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
	ICP interference check sample
	GFAA quality control
*	ICP serial dilution
	Sample result verification
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

Non-CLP Organic and Inorganic Parameters

*	Method compliance
*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike/matrix spike duplicate
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
*	Surrogate recovery
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

DATA VALIDATION QUALIFIERS AND CODES

Data Validation Qualifiers

UJ	Estimated nondetected result
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NJ	Tentatively Identified Compound (TIC)

Data Validation Qualifier Codes

a	Surrogate recovery exceedance
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c	Matrix spike/Matrix spike duplicates recovery exceedance
d	Duplicate precision exceedance
e	Internal standard exceedance
f	Calibration exceedance
g	Quantification below reporting limit
h	Other qualifications

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP ABT02

					Analyses						
Sample ID	Matrix	Date Collected	Quality Control ID	Validation Criteria*	C R V I						
033-IWTP360-034	Soil	3/5/04	MS/MSD		X						
033-IWTP360-035	Soil	3/5/04			X						
033-IWTP360-019	Soil	3/5/04			X						
033-IWTP360-024	Soil	3/5/04			X						
033-IWTP360-025	Soil	3/5/04		Full	X						
033-IWTP360-020	Water	3/5/04		Full	X						
033-IWTP360-027	Soil	3/5/04		Full	X						
033-IWTP360-028	Soil	3/5/04			X						
033-IWTP360-036	Water	3/5/04			X						
033-IWTP360-023	Water	3/5/04		Full	X						
033-IWTP360-030	Water	3/5/04	FIELD DUPLICATE OF	033-IWTP360-029	X						
033-IWTP360-029	Water	3/5/04		JS 6-1-04	X						

* = Cursory validation performed on all samples
*** = Full review performed on indicated parameters only
CRVI = Hexavalent Chromium
MS/MSD = Matrix Spike/Matrix Spike Duplicate
** = MS/MSD/DUP performed on indicated parameters only
DUP = Matrix duplicate

DATA ASSESSMENT

NON-CLP INORGANIC AND PHYSICAL ANALYSIS

The following non-CLP inorganic and physical parameter was analyzed for: Hexavalent Chromium (CRVI).

I. Holding Times

A. The 24 hour analysis holding time requirement for waters and the 30 day extraction and 7 day analysis holding times for soils for CRVI were met.

II. Calibrations

A. All instruments were calibrated daily and the proper number of standards were used as required by the method.

B. All Initial and Continuing calibration verification were performed at the proper frequency all QC limits were met.

III. Blank Contamination

A. No contaminant concentrations were found in the method blanks. No field blanks were identified in this SDG.

IV. Matrix Spike (MS)

A. The MS/MSD analysis was performed on samples 033-IWTP360-034 and 033-IWTP360-031. Percent recoveries (%R) were within the QC limits and relative percent differences (RPD) were within the ≤20% QC limits for inorganic analyses and the ≤10% QC limits for physical analyses.

V. Matrix Duplicate (DUP)

A. The DUP analysis was not performed for this SDG. Although this is a protocol violation, the associated MS/MSD relative percent differences (RPD) were within the QC limits and no data was qualified.

VI. Laboratory Control Sample (LCS)

A. The LCS QC samples were analyzed as required under the TTEMI SOW. The percent recoveries (%R) were within the QC limits.

VII. Field Duplicate

A. No field duplicate samples were identified in this SDG.

VIII. Other Qualifications

A. No results were reported below the RL.

Full Validation Criteria for Samples 033-IWTP360-025*, 033-IWTP360-020*, 033-IWTP360-027*, and 033-IWTP360-023*

IX. Analyte Quantitation and Reported Detection Limits

A. Sample results were recalculated, with the proper dilution factors, weights, volumes, and percent moisture used to calculate the sample results. The samples were found to be correctly quantitated. The reported detection limits were consistent with Tetra Tech EMI's required report limits and reflect any dilutions, weights, and volumes.

B. The soil sample results were reported on a wet weight basis. Per method requirements, sample results must be reported on a dry weight basis.

OVERALL ASSESSMENT OF DATA

I. Method Compliance and Additional Comments

A. All analyses were conducted within all specifications of the requested methods with the exceptions listed below.

- For the non-CLP inorganic and physical analysis, the DUP analysis was not performed for this SDG. Although this is a protocol violation, the associated MS/MSD relative percent differences (RPDs) were within the QC limits and no data was qualified.

- For the non-CLP inorganic and physical analysis, the soil sample results were reported on a wet weight basis. Per method requirements, sample results must be reported on a dry weight basis.

II. Usability

Non-CLP Inorganic and Physical Analysis

A. No results for non-CLP inorganic and physical analysis were rejected in this SDG.

B. No samples were reextracted or reanalyzed for non-CLP inorganic and physical analysis in this SDG.

III. The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Based upon the cursory and full data validation all other results are considered valid and usable for all purposes.

Final EDD Tables

HEXAVALENT CHROMIUM ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Curtis and Tompkins Ltd.

Matrix : SOIL

Date: 06/01/04

TtEMI Sample ID / Units	033-IWTP360-019 (MG/KG)			033-IWTP360-024 (MG/KG)			033-IWTP360-025 (MG/KG)			033-IWTP360-027 (MG/KG)			033-IWTP360-028 (MG/KG)		
Sample Location	IWTP360-VE03-SO-5			IWTP360-VE05-SO-3			IWTP360-VE05-SO-5			IWTP360-VE06-SO-3			IWTP360-VE06-SO-5		
Sample Depth (ft)	4.16 - 4.66			2.50 - 3.00			4.50 - 5.00			2.50 - 3.00			4.50 - 5.00		
Date Sampled / SDG Number	03/05/04 ABT02			03/05/04 ABT02			03/05/04 ABT02			03/05/04 ABT02			03/05/04 ABT02		
Date Extracted / Analyzed	03/11/04 03/11/04			03/11/04 03/11/04			03/11/04 03/11/04			03/11/04 03/11/04			03/11/04 03/11/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
HEXAVALENT CHROMIUM	0.24			0.14			0.06	U		0.08			0.06	U	

TtEMI Sample ID / Units	033-IWTP360-034 (MG/KG)			033-IWTP360-035 (MG/KG)		
Sample Location	IWTP360-DP05-SO-2			IWTP360-DP05-SO-8		
Sample Depth (ft)	1.50 - 2.00			4.00 - 4.50		
Date Sampled / SDG Number	03/05/04 ABT02			03/05/04 ABT02		
Date Extracted / Analyzed	03/11/04 03/11/04			03/11/04 03/11/04		
Analyte	Result	Val	Com	Result	Val	Com
HEXAVALENT CHROMIUM	0.05	U		0.06	U	

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

PERCENT MOISTURE FOR OTHER RESULTS ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Curtis and Tompkins Ltd.

Matrix : SOIL

TtEMI Sample ID / Units	033-IWTP360-019 (%)			033-IWTP360-024 (%)			033-IWTP360-025 (%)			033-IWTP360-027 (%)			033-IWTP360-028 (%)		
Sample Location	IWTP360-VE03-SO-5			IWTP360-VE05-SO-3			IWTP360-VE05-SO-5			IWTP360-VE06-SO-3			IWTP360-VE06-SO-5		
Sample Depth (ft)	4.16 - 4.66			2.50 - 3.00			4.50 - 5.00			2.50 - 3.00			4.50 - 5.00		
Date Sampled / SDG Number	03/05/04 ABT02			03/05/04 ABT02			03/05/04 ABT02			03/05/04 ABT02			03/05/04 ABT02		
Date Extracted / Analyzed	04/01/04 04/01/04			04/01/04 04/01/04			04/01/04 04/01/04			04/01/04 04/01/04			04/01/04 04/01/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
MOISTURE, PERCENT	11			10			10			7			12		

TtEMI Sample ID / Units	033-IWTP360-034 (%MST)			033-IWTP360-035 (%)		
Sample Location	IWTP360-DP05-SO-2			IWTP360-DP05-SO-8		
Sample Depth (ft)	1.50 - 2.00			4.00 - 4.50		
Date Sampled / SDG Number	03/05/04 ABT02			03/05/04 ABT02		
Date Extracted / Analyzed	03/10/04 03/10/04			04/01/04 04/01/04		
Analyte	Result	Val	Com	Result	Val	Com
MOISTURE	5.9			NA		
MOISTURE, PERCENT	NA			10		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

HEXAVALENT CHROMIUM ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Curtis and Tompkins Ltd.

Matrix : WATER

Date: 06/01/04

TtEMI Sample ID / Units	033-IWTP360-020 (MG/L)			033-IWTP360-023 (MG/L)			033-IWTP360-029 (MG/L)			033-IWTP360-030 (MG/L)			033-IWTP360-036 (MG/L)		
Sample Location	IWTP360-VE03-GW-6			IWTP360-VE04-GW-6			IWTP360-VE06-GW-6			IWTP360-VE06-GW-6DUP			IWTP360-DP05-GW-7		
Sample Depth (ft)	7.00 - 7.00			6.00 - 6.00			8.00 - 10.00			8.00 - 10.00			8.00 - 8.00		
Date Sampled / SDG Number	03/05/04 ABT02			03/05/04 ABT02			03/05/04 ABT02			03/05/04 ABT02			03/05/04 ABT02		
Date Extracted / Analyzed	03/05/04 03/05/04			03/05/04 03/05/04			03/05/04 03/05/04			03/05/04 03/05/04			03/05/04 03/05/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
HEXAVALENT CHROMIUM	0.02			0.01	U		0.01	U		0.01	U		0.02		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

Note :

Chain of Custody
and
Technical Review Checklist

17017

Tetra Tech EM Inc.

CHAIN OF CUSTODY RECORD

10670 White Rock Road, Suite 100
Rancho Cordova, CA 95670
(916) 852-8300 FAX (916) 852-8307

DATE: 3/5/04
CHAIN OF CUSTODY NUMBER: № 6235
LABORATORY NUMBER: 042187
PAGE 1 OF 2

PROJECT NAME: IWTP360	PROJECT MANAGER: Glenis Foulk
PROJECT NUMBER: G9016033O502	TELEPHONE NUMBER: 916-852-8300
PROJECT LOCATION: Alameda Point	DESTINATION LABORATORY: Curtis & Tompkins
SAMPLER(S): R Shah	ADDRESS: 2323 Fifth Street
SAMPLER SIGNATURE(S):	CITY: Berkeley STATE: CA ZIP:
SITE CONTACT/TELEPHONE NUMBER: Brad Shelton /	LABORATORY TELEPHONE NUMBER: 510-486-0900

REQUESTED ANALYSES

	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX TYPE	NO./TYPE OF CONTAINERS	TURN AROUND TIME	Hex Chromium										REMARKS (GRAB, COMPOSITE, ETC.)
	~~033-IWTP360-023~~	~~3/5~~		~~water~~	~~1-500mL~~	~~standard~~	~~X~~										
-1	033-IWTP360-034	3/5	915	soil	1-8oz jar	standard	X										
-2	033-IWTP360-035	3/5	920	soil	1-8oz jar	standard	X										
-3	033-IWTP360-019	3/5	1045	soil	1-8oz jar	standard	X										
-4	033-IWTP360-024	3/5	1145	soil	2/1-8oz jar	standard	X										
-5	033-IWTP360-025	3/5	1155	soil	1-8oz jar	standard	X										
-6	033-IWTP360-020	3/5	1240	water	1-500mL	standard	X										
	~~033-IWTP360-0__~~	~~3/5~~	~~128~~	~~soil~~	~~1 8oz jar~~	~~standard~~	~~X~~										
-7	033-IWTP360-027	3/5	1245	soil	1 8oz jar	standard	X										
-8	033-IWTP360-028	3/5	1250	soil	1-8oz jar	standard	X										
-9	033-IWTP360-036	3/5	1500	water	1-500mL	standard	X										

SHIPPED VIA: hand delivered AIRBILL #:

SPECIAL INSTRUCTIONS:

RELINQUISHED BY (SIGNATURE)	PRINT NAME/COMPANY	DATE	TIME	RECEIVED BY (SIGNATURE)	PRINT NAME/COMPANY	DATE	TIME
Brad Shelton	Brad Shelton (TtEMI)	3/05/04	1800				

RECEIVED AT LAB BY (PRINT AND SIGN): Anna Pajarillo Anna Pajarillo C+T Lab 3/5/4 1800

DISTRIBUTION: WHITE = LABORATORY YELLOW = PROJECT MANAGER PINK = FILE

cc: Brad w/ Data.

Curtis & Tompkins, Ltd.
Analytical Laboratory Since 1878
2323 Fifth Street
Berkeley, CA 94710
(510) 486-0900 Phone
(510) 486-0532 Fax

CHAIN OF CUSTODY

C & T LOGIN #: 171017

042187

Project No.: G90160330502
Project Name: IWTP360
Project P.O.: G90160330502
Turnaround Time: Standard

Sampler: RShah
Report To: Elynis Foulk
Company: TetraTech EM Inc
Telephone: 916-852-8300
Fax:

Lab No.	Sample ID.	Sampling Date Time	Matrix: Soil	Matrix: Water	Matrix: Waste	Matrix	# of Containers	Preservative: HCL	Preservative: H_2SO_4	Preservative: HNO_3	Preservative: ICE	Preservative	Analysis: Hex Chromium
-10	033-IWTP360-023	3/5/04 1550		X			1 500mL						X
-11	033-IWTP360-030	3/5/04 1645		X			1 500mL						X
-12	033-IWTP360-029	3/5/04 1650		X			1 500mL						X

Notes:

SAMPLE RECEIPT
☑ Intact ☑ Cold
☑ On Ice ☐ Ambient
Preservative Correct?
☐ Yes ☐ No ☐ N/A

RELINQUISHED BY:		RECEIVED BY:	
Brad Shelton 1600/3/05/04	DATE / TIME	Anna Pazenik 3/5/04 1800	DATE / TIME
	DATE / TIME		DATE / TIME
	DATE / TIME		DATE / TIME

SIGNATURE

5

DATA VALIDATION REPORT
Technical Reviewer's QC Checklist

SDG Number: ABTØ2

- [x] Copies of chain-of-custodies are present for all samples in the sample delivery group (SDG).
- [x] All samples in the SDG are listed in the analytical summary table and all the requested analyses are accurately tabulated.
- [x] All QC samples are identified on the tables such as equipment rinsates, field blanks, trip blanks, MS/MSD, and field duplicates.
- [x] Analytical result sheets or electronic deliverable data results are present for all samples and analyses identified on the analytical summary table.
- [x] Each analytical result with a qualifier has a comment code associated with it.
- [x] The MS/MSD and field duplicate samples that are discussed in the narrative match those identified on the analytical summary table.
- [x] Dilutions have been discussed in the narrative for all samples with elevated reporting limits.
- [x] The Overall Assessment in each section is thorough and mentions all issues where a problem arose. Field QC samples such as equipment rinsates, field blanks, and trip blanks are also discussed.
- [x] All qualifiers on the data tables are accounted for in the narrative.
- [ ]

PROGRESS CHECKLIST

- [x] Technical Review Completed
- [x] Review Comments Incorporated
- [ ] Missing items needed for completeness:____________________

- [x] Ready for binding and doctrack!

John Swanson
6-1-Ø4

dvtrchk.plt

Technical Review Addendum

To Validation Report

For SDG # ABT 03

Technical Review Addendum
to
Validation Report

DATA VALIDATION REPORT ADDENDUM
MODIFICATION TO THE REPORT
ABT03

Prepared by:	John Swanson, Tetra Tech EM, Inc.
Date:	5/18/04
Site Name/Job Number:	Alameda/G9016.033.05.02
Laboratory:	Curtis & Tompkins, Ltd., Berkeley, California
Data Validation Firm:	Laboratory Data Consultants, Inc.

There were no modifications to the validation report.

Data Validation Report

DATA VALIDATION REPORT

Site:	NAS Alameda Point
Contract Task Order (CTO) No.:	G9016.033.05.02
Laboratory:	Applied P & Ch Laboratory.
Data Reviewer:	Richard Amano, Stacey Swenson, Ming Hwang, and Steve Ziliak.
Firm/Proj. No:	Laboratory Data Consultants, Inc./11935A
Review Date:	May 11, 2004
Sample Delivery Group (SDG) No.:	ABT03

Sample Nos.:			
	033-IWTP360-001	033-IWTP360-008	033-IWTP360-007MS
	033-IWTP360-002	033-IWTP360-009	033-IWTP360-007MSD
	033-IWTP360-007	033-IWTP360-011	

* Full Validation Sample

Matrix: Soil and Water

Collection Date(s): March 3, 2004

The data were qualified according to the U.S. Environmental Protection Agency (EPA) documents "USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Data Review" (February 1994). In addition, the Tetra Tech EMI, Inc. documents "Data Validation Guidelines for CLP Inorganic Analyses," "Data Validation Guidelines for Non-CLP Inorganic and Physical Analyses" (March 1997), and the document entitled "PRC Comprehensive Long-term Environmental Action Navy II Analytical Services Statement of Work" (September 1998) were used along with other specified criteria in EPA methods. Data validation requirements are presented below.

I certify that all data validation criteria outlined in the above referenced documents were assessed, and any qualifications made to the data were in accordance with those documents.

Certified by Richard Amano
Principal Chemist

DATA VALIDATION REQUIREMENTS

Full validation includes all parameters listed below. Cursory validation parameters are indicated by an asterisk (*).

CLP Organic Parameters

*	Holding times
	GC/MS instrument performance check
*	Initial and continuing calibrations
*	Blanks
*	Surrogate recovery
*	Matrix spike/matrix spike duplicate
*	Laboratory control sample or blank spike
*	Field duplicates
*	Internal standard performance
	Target compound identification
	Tentatively identified compounds
	Compound quantitation
	Reported detection limits
	System performance
*	Overall assessment of data for the SDG

CLP Inorganic Parameters

*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
	ICP interference check sample
	GFAA quality control
*	ICP serial dilution
	Sample result verification
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

Non-CLP Organic and Inorganic Parameters

*	Method compliance
*	Holding times
*	Initial and continuing calibrations
*	Blanks
*	Matrix spike/matrix spike duplicate
*	Laboratory control sample or blank spike
*	Field duplicates
*	Matrix duplicates
*	Surrogate recovery
	Analyte quantitation
	Reported detection limits
*	Overall assessment of data for the SDG

DATA VALIDATION QUALIFIERS AND CODES

Data Validation Qualifiers

UJ	Estimated nondetected result
J	Estimated detected result
R	Rejected result
NJ	Tentatively Identified Compound (TIC)

Data Validation Qualifier Codes

a	Surrogate recovery exceedance
b	Laboratory method blank and common blank contamination, Field blank contamination
c	Matrix spike/Matrix spike duplicates recovery exceedance
d	Duplicate precision exceedance
e	Internal standard exceedance
f	Calibration exceedance
g	Quantification below reporting limit
h	Other qualifications

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP ABT03

Sample ID	Matrix	Date Collected	Quality Control ID	Validation Criteria*	Analyses						
					CRVI						
033-IWTP360-001	Soil	3/3/04			X						
033-IWTP360-002	Soil	3/3/04			X						
033-IWTP360-007	Water	3/3/04	MS/MSD		X						
033-IWTP360-008	Water	3/3/04			X						
033-IWTP360-009	Water	3/3/04			X						
033-IWTP360-011	Water	3/3/04			X						

* = Cursory validation performed on all samples
*** = Full review performed on indicated parameters only
CRVI = Hexavalent Chromium
MS/MSD = Matrix Spike/Matrix Spike Duplicate
** = MS/MSD/DUP performed on indicated parameters only
DUP = Matrix duplicate

DATA ASSESSMENT

NON-CLP INORGANIC AND PHYSICAL ANALYSIS

The following non-CLP inorganic and physical parameter was analyzed for: Hexavalent Chromium (CRVI).

I. Holding Times

A. The 28 day analysis holding time requirement for CRVI was met.

II. Calibrations

A. All instruments were calibrated daily and the proper number of standards were used as required by the method.

B. All Initial and Continuing calibration verification were performed at the proper frequency all QC limits were met.

III. Blank Contamination

A. No contaminant concentrations were found in the method blanks. No field blanks were identified in this SDG.

IV. Matrix Spike (MS)

A. The MS/MSD analysis was performed on sample 033-IWTP360-007. Percent recoveries (%R) were within the QC limits and relative percent differences (RPD) were within the ≤20% QC limits for inorganic analyses and the ≤10% QC limits for physical analyses.

V. Matrix Duplicate (DUP)

A. The DUP analysis was not performed for this SDG. Although this is a protocol violation, the associated MS/MSD relative percent differences (RPD) were within the QC limits and no data was qualified.

VI. Laboratory Control Sample (LCS)

A. The LCS QC samples were analyzed as required under the TTEMI SOW. The percent recoveries (%R) were within the QC limits.

VII. Field Duplicate

A. No field duplicate samples were identified in this SDG.

VIII. Other Qualifications

A. No results were reported below the RL.

OVERALL ASSESSMENT OF DATA

I. Method Compliance and Additional Comments

A. All analyses were conducted within all specifications of the requested methods with the exceptions listed below.

- For the non-CLP inorganic and physical analysis, the DUP analysis was not performed for this SDG. Although this is a protocol violation, the associated MS/MSD relative percent differences (RPDs) were within the QC limits and no data was qualified.

II. Usability

<u>Non-CLP Inorganic and Physical Analysis</u>

A. No results for non-CLP inorganic and physical analysis were rejected in this SDG.

B. No samples were reextracted or reanalyzed for non-CLP inorganic and physical analysis in this SDG.

III. The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Based upon the cursory and full data validation all other results are considered valid and usable for all purposes.

Final EDD Tables

HEXAVALENT CHROMIUM ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Curtis and Tompkins Ltd.

Matrix : SOIL

Date: 05/18/04

TtEMI Sample ID / Units	033-IWTP360-001 (MG/KG)			033-IWTP360-002 (MG/KG)		
Sample Location	IWTP360-DP01-SO-2			IWTP360-DP01-SO-8		
Sample Depth (ft)	1.50 - 2.00			4.50 - 5.00		
Date Sampled / SDG Number	03/03/04 ABT03			03/03/04 ABT03		
Date Extracted / Analyzed	03/11/04 03/11/04			03/11/04 03/11/04		
Analyte	Result	Val	Com	Result	Val	Com
HEXAVALENT CHROMIUM	0.05	U		0.06	U	

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems

g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

Note :

PERCENT MOISTURE FOR OTHER RESULTS ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Curtis and Tompkins Ltd.

Matrix : SOIL

Date: 05/18/04

TtEMI Sample ID / Units	033-IWTP360-001 (%)			033-IWTP360-002 (%)		
Sample Location	IWTP360-DP01-SO-2			IWTP360-DP01-SO-8		
Sample Depth (ft)	1.50 - 2.00			4.50 - 5.00		
Date Sampled / SDG Number	03/03/04 ABT03			03/03/04 ABT03		
Date Extracted / Analyzed	03/12/04 03/12/04			03/12/04 03/12/04		
Analyte	Result	Val	Com	Result	Val	Com
MOISTURE, PERCENT	7			11		

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

Note :

HEXAVALENT CHROMIUM ANALYSIS

Project : ALAMEDA DO 033
Laboratory : Curtis and Tompkins Ltd.

Matrix : WATER

Date: 05/18/04

TtEMI Sample ID / Units	033-IWTP360-007 (MG/L)			033-IWTP360-008 (MG/L)			033-IWTP360-009 (MG/L)			033-IWTP360-011 (MG/L)		
Sample Location	IWTP360-DP03-GW-7			IWTP360-DP03-GW-12			IWTP360-DP04-GW-7			IWTP360-DP04-GW-7DUP		
Sample Depth (ft)	5.50 - 5.50			10.50 - 10.50			6.00 - 6.00			6.00 - 6.00		
Date Sampled / SDG Number	03/03/04 ABT03			03/03/04 ABT03			03/03/04 ABT03			03/03/04 ABT03		
Date Extracted / Analyzed	03/04/04 03/04/04			03/04/04 03/04/04			03/04/04 03/04/04			03/04/04 03/04/04		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
HEXAVALENT CHROMIUM	0.01	U		0.01	U		0.01	U		0.01	U	

Validity (Val):
U - Non-detected
UJ - Non-detected estimated
R - Rejected
J - Estimated concentration

NA - Not Analyzed

Applicable Comments (Com):
a - Surrogate recovery problem
b - Blank contamination problems
c - Matrix spike recovery problems
d - Duplicate (precision) problems
e - Internal standard problems
f - Calibration problems
g - Quantification below reporting limit
h - Other problems, refer to data validation narrative
k - Holding time exceeded
p - >25%D between columns
y - Resembles a fuel pattern but does not match the standard
z - Unknown peaks, not a fuel pattern

Note :

Chain of Custody
and
Technical Review Checklist

F10456

CHAIN OF CUSTODY RECORD

Tetra Tech EM Inc.

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Rancho Cordova, CA 95670
(916) 852-8300 FAX (916) 852-8307

DATE: 3/3/04	CHAIN OF CUSTODY NUMBER: № 6232
LABORATORY NUMBER: 042187	PAGE 1 OF 1

PROJECT NAME: IWTP360	PROJECT MANAGER: Glynis Foulk
PROJECT NUMBER: C-9016033050 2	TELEPHONE NUMBER: 916-852-8300
PROJECT LOCATION: Alameda Point	DESTINATION LABORATORY: Curtis & Tompkins
SAMPLER(S): R Shah	ADDRESS: 2323 Fifth Street
SAMPLER SIGNATURE(S): R Shah	CITY: Berkeley STATE: CA ZIP: 94710
SITE CONTACT/TELEPHONE NUMBER: B Shelton/916-225-3800	LABORATORY TELEPHONE NUMBER: 510-486-0900

REQUESTED ANALYSES

	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX TYPE	NO./TYPE OF CONTAINERS	TURN AROUND TIME	Hex Chromium										REMARKS (GRAB, COMPOSITE, ETC.)
-1	033-IWTP360-001	3/3	930	soil	1-9oz jar	standard	X										
-2	033-IWTP360-002	3/3	1015	soil	1-9oz jar	standard	X										
-3	033-IWTP360-007	3/3	1330	~~soil~~	1-~~9oz jar~~	standard	X										
-4	033-IWTP360-008	3/3	1415	water	2-500mL	standard	X										
-5	033-IWTP360-009	3/3	1445	water	2-500mL	standard	X										
-6	033-IWTP360-011	3/3	1500	water	2-500mL	standard	X										
	~~033-IWTP360-005~~	~~3/3~~	~~1630~~	~~soil~~	~~1-9oz jar~~	~~standard~~	~~X~~										
	~~033-IWTP360-009~~	~~3/3~~	~~1700~~														

SHIPPED VIA: hand delivered AIRBILL #:

SPECIAL INSTRUCTIONS:

RELINQUISHED BY (SIGNATURE)	PRINT NAME/COMPANY	DATE	TIME	RECEIVED BY (SIGNATURE)	PRINT NAME/COMPANY	DATE	TIME
Brad Shelton	Brad Shelton/TTEMI	3/3	1805				
				RECEIVED AT LAB BY (PRINT AND SIGN): [signature] CT		3/3/04	1805

DISTRIBUTION: WHITE = LABORATORY YELLOW = PROJECT MANAGER PINK = FILE

DATA VALIDATION REPORT
Technical Reviewer's QC Checklist

SDG Number: ABTØ3

- [x] Copies of chain-of-custodies are present for all samples in the sample delivery group (SDG).
- [x] All samples in the SDG are listed in the analytical summary table and all the requested analyses are accurately tabulated.
- [x] All QC samples are identified on the tables such as equipment rinsates, field blanks, trip blanks, MS/MSD, and field duplicates.
- [x] Analytical result sheets or electronic deliverable data results are present for all samples and analyses identified on the analytical summary table.
- [x] Each analytical result with a qualifier has a comment code associated with it.
- [x] The MS/MSD and field duplicate samples that are discussed in the narrative match those identified on the analytical summary table.
- [x] Dilutions have been discussed in the narrative for all samples with elevated reporting limits.
- [x] The Overall Assessment in each section is thorough and mentions all issues where a problem arose. Field QC samples such as equipment rinsates, field blanks, and trip blanks are also discussed.
- [x] All qualifiers on the data tables are accounted for in the narrative.
- [ ]

PROGRESS CHECKLIST

- [x] Technical Review Completed
- [x] Review Comments Incorporated
- [ ] Missing items needed for completeness:______________________________

- [x] Ready for binding and doctrack!

John Swanson 5-18-Ø4

dvtrchk.plt

APPENDIX F

FIELD DOCUMENTATION

Appendix F

Boring Logs
Daily Field Reports
Manifests for Investigation Derived Waste

R&M EIE, Inc

SOIL BORING AND WELL INSTALLATION AND VISUAL CLASSIFICATION LOG

Project Name: IWTP360 Closure Confirmation Sampling

Job Number: R&M 2009

Boring Number: IWTP360- DP-01	Date Started: 3/3/04
Drilling Method: (Bold *one*) HSA Continuous Core/**GeoProbe with Hydropunch**/Hand Auger	Date Completed: 3/3/04
	Logged By: Ramesh Shah, R.G.
Outer Diameter of Boring: 2 Inch	Drilling Subcontractor: Vironex Environmental Field Services
Inner Diameter of Well Casing:	Driller: Brandon Penera
Depth to Water (ft./bgs.) Initial 7 ft, final 4.57 ft below ground surface	Location Sketch: Near east door of Building 414

Note Sample ID number prefix is 033-IWTP360-

Time	Depth (ft) bgs	Drive Interval	Recovered Interval	Sample ID	Blow Count per six inches	Description	USCS soil symbol	Well construction	OVM (ppm)
9:10						No asphalt or concrete, 4" Aggregate base			
9:15	2		–	001	–	1.5' to 2' 7.5 YR 3/5 dark brown, silty SAND, loose, moist and micaceous	SM		0.0
9:30	4		–	002	–	4' 2.5 YR 2/5, gray med. SAND poorly graded, loose wet, with black oily materials	SP		0.0
			–	–	–	6'to 6'-2" reddish pebble and gravel			
	6					7' 2.5 YR 2/4 dark gray medium SAND, loose wet	SP		
			–	–	–	Total depth of borehole 8 ft bgs. Three boreholes were punched to collect sample just above water table. DP-01A 8ft DP-01B 5.5 ft, hit water table DP-01 C 4.5 ft All three boreholes were backfilled with cement bentonite grout.			

R&M EIE, Inc

SOIL BORING AND WELL INSTALLATION AND VISUAL CLASSIFICATION LOG

Project Name: IWTP360 Closure Confirmation Sampling

Job Number: R&M 2009

Boring Number: IWTP360- DP-02	Date Started: 3/3/04
Drilling Method: (Bold *one*) HSA Continuous Core/**GeoProbe with Hydropunch**/Hand Auger	Date Completed: 3/4/04
	Logged By: Ramesh Shah, R.G.
Outer Diameter of Boring: 2 Inch	Drilling Subcontractor: Vironex Environmental Field Services
Inner Diameter of Well Casing:	Driller: Brandon Penera
Depth to Water (ft./bgs.) Initial 7 ft below ground surface	Location Sketch: Near west door of Building 414

Note Sample ID number prefix is 033-IWTP360-

Time	Depth (ft) bgs	Drive Interval	Recovered Interval	Sample ID	Blow Count per six inches	Description	USCS soil symbol	Well construction	OVM (ppm)
						2 "asphalt, 4 " Aggregate base			
10:37	2		–	003	–	1.5' to 2', 2..5 YR 2/4 gray medium SAND poorly graded, loose, moist and micaceous Refusal at 2 ft depth. Moved as DP-02B, south of DP-02A	SP		0.0
9:00 3/4/04	4		–	004	–	4.5 to 5', 2.5 YR 2/4, gray med. SAND poorly graded, loose wet	SP		0.0
	6		–	–	–	Groundwater samples collected by Hydropunch. Groundwater sample –005 collected with screen interval at 5 ft to 6 ft bgs. Groundwater sample –006 collected with screen interval at 10 ft to 12 ft bgs.			
			–	–	–	Both boreholes (DP-02A and DP-02B) were backfilled with cement bentonite grout.			

R&M EIE, Inc

SOIL BORING AND WELL INSTALLATION AND VISUAL CLASSIFICATION LOG

Project Name: IWTP360 Closure Confirmation Sampling

Job Number: R&M 2009

Boring Number: IWTP360- DP-03	Date Started: 3/3/04
Drilling Method: (Bold *one*) HSA Continuous Core/**GeoProbe with Hydropunch**/Hand Auger	Date Completed: 3/3/04
	Logged By: Ramesh Shah, R.G.
Outer Diameter of Boring: 2 Inch	Drilling Subcontractor: Vironex Environmental Field Services
Inner Diameter of Well Casing:	Driller: Brandon Penera
Depth to Water (ft./bgs.) Initial 6 ft below ground surface	Location Sketch:
Note Sample ID number prefix is 033-IWTP360-	

Time	Depth (ft) bgs	Drive Interval	Recovered Interval	Sample ID	Blow Count per six inches	Description	USCS soil symbol	Well construction	OVM (ppm)
13:30			–	–	–	2 "asphalt, 4 " Aggregate base. Hydropunch hole for groundwater sampling, no soil samples			
			–	–	–	Groundwater samples collected by Hydropunch. Groundwater sample –007 collected with screen interval at 5 ft to 6 ft bgs. Groundwater sample –008 collected with screen interval at 8 ft to 10 ft bgs.			
			–	–	–	Hydopunch hole (DP-03) was backfilled with cement bentonite grout.			
			–	–	–				

R&M EIE, Inc

SOIL BORING AND WELL INSTALLATION AND VISUAL CLASSIFICATION LOG

Project Name: IWTP360 Closure Confirmation Sampling

Job Number: R&M 2009

Boring Number: IWTP360- DP-04	Date Started: 3/3/04
Drilling Method: (Bold *one*) HSA Continuous Core/**GeoProbe with Hydropunch**/Hand Auger	Date Completed: 3/5/04
	Logged By: Ramesh Shah, R.G.
Outer Diameter of Boring: 2 Inch	Drilling Subcontractor: Vironex Environmental Field Services
Inner Diameter of Well Casing:	Driller: Brandon Penera
Depth to Water (ft./bgs.) Initial 6 ft below ground surface	Location Sketch:

Note Sample ID number prefix is 033-IWTP360-

Time	Depth (ft) bgs	Drive Interval	Recovered Interval	Sample ID	Blow Count per six inches	Description	USCS soil symbol	Well construction	OVM (ppm)
						2 "asphalt, 4 " Aggregate base. Hydropunch hole for groundwater sampling, no soil samples			
14:40			–	–	–				–
			–	–	–	Groundwater samples collected by Hydropunch. Groundwater sample –009 collected with screen interval at 5 ft to 6 ft bgs. Groundwater sample –011 duplicate of –009			–
			–	–	–	Installed a temporary well with 1-inch diameter PVC pipe and screen (0.010 slots) from 8ft to 10 ft bgs.			–
			–	–	–	Water level 4.95 ft bgs at 9:30 on 3/5/04. Attempted to collect groundwater sample after purging three well volumes (2 liter). Well went dry. Therefore water sample for deep intervals (8 ft to 10 ft bgs) was not collected. Hydopunch hole (DP-04) was backfilled with cement bentonite grout.			–

R&M EIE, Inc

SOIL BORING AND WELL INSTALLATION AND VISUAL CLASSIFICATION LOG

Project Name: IWTP360 Closure Confirmation Sampling

Job Number: R&M 2009

Boring Number: IWTP360- DP-05	Date Started: 3/3/04
Drilling Method: (Bold *one*) HSA Continuous Core/**GeoProbe with Hydropunch**/Hand Auger	Date Completed: 3/4/04
	Logged By: Ramesh Shah, R.G.
Outer Diameter of Boring: 2 Inch	Drilling Subcontractor: Vironex Environmental Field Services
Inner Diameter of Well Casing:	Driller: Brandon Penera
Depth to Water (ft./bgs.) Initial 7 ft below ground surface	Location Sketch: Near west door of Building 414
Note Sample ID number prefix is 033-IWTP360-	

Time	Depth (ft) bgs	Drive Interval	Recovered Interval	Sample ID	Blow Count per six inches	Description	USCS soil symbol	Well construction	OVM (ppm)
						2"asphalt, 4" Aggregate base			
10:37	2		–	034	–	1.5' to 2', 2.5 YR 2/4 gray medium SAND poorly graded, loose, moist and micaceous Refusal at 2-ft depth. Moved as DP-02B, south of DP-02A	SP		0.0
9:00 3/4/04	4		–	035	–	4.5' to 5', 2.5 YR 2/4, gray med. SAND poorly graded, loose wet	SP		0.0
	6		–	–	–				
	8		–	–	–	Groundwater sample collected by Hydropunch. Groundwater sample –036 collected with screen interval at 8 ft to 10 ft bgs.			

R&M EIE, Inc

SOIL BORING AND WELL INSTALLATION AND VISUAL CLASSIFICATION LOG

Project Name: IWTP360 Closure Confirmation Sampling

Job Number: R&M 2009

Boring Number: IWTP360- VE-01	Date Started: 3/4/04
Drilling Method: (Bold *one*) HSA Continuous Core/GeoProbe with Hydropunch/Hand Auger. **Vacuum Excavation with Hydropunch**	Date Completed: 3/4/04
	Logged By: Ramesh Shah, R.G.
Outer Diameter of Boring: 4 Inch +	Drilling Subcontractor: Vironex Environmental Field Services
Inner Diameter of Well Casing:	Driller: Brandon Penera
Depth to Water (ft./bgs.) Initial 5 ft below ground surface	Location Sketch:
Note Sample ID number prefix is 033-IWTP360-	

Time	Depth (ft) bgs	Drive Interval	Recovered Interval	Sample ID	Blow Count per six inches	Description	USCS soil symbol	Well construction	OVM (ppm)
						2"asphalt and Aggregate base			
10:20	2.0					1.5' to 2', 10YR 2/4 brown medium SAND poorly graded, loose, moist and micaceous	SP		0.0
				012		012 – 3.0-3.5'			
	4			013		013 – 4.0-4.5' Refusal at 4.5-ft depth with vacuum excavator. Could not penetrate with heavy bar. Similar refusals also occur in VE-2 at the same depth.			
						Vacuum excavation created large hole (void). Borehole backfilled with cement bentonite grout.			

R&M EIE, Inc

SOIL BORING AND WELL INSTALLATION AND VISUAL CLASSIFICATION LOG

Project Name: IWTP360 Closure Confirmation Sampling

Job Number: R&M 2009

Boring Number: IWTP360- VE-02	Date Started: 3/4/04
Drilling Method: (Bold *one*) HSA Continuous Core/GeoProbe with Hydropunch/Hand Auger. **Vacuum Excavation with Hydropunch**	Date Completed: 3/4/04
	Logged By: Ramesh Shah, R.G.
Outer Diameter of Boring: 4 Inch +	Drilling Subcontractor: Vironex Environmental Field Services
Inner Diameter of Well Casing:	Driller: Brandon Penera
Depth to Water (ft./bgs.) Initial approximately 4 ft below ground surface	Location Sketch: Inside fenced area

Note Sample ID number prefix is 033-IWTP360-

Time	Depth (ft) bgs	Drive Interval	Recovered Interval	Sample ID	Blow Count per six inches	Description	USCS soil symbol	Well construction	OVM (ppm)
						2"asphalt and Aggregate base			
11:35	2.5					1.5' to 2', 10YR 2/4 brown medium SAND poorly graded, loose, moist and micaceous	SP		0.0
				015		015 – 3.0-3.5'			
						Same as above			
	4								
						Refusal at 4.5-ft depth with vacuum excavator. Could not penetrate with heavy bar. Similar refusals also occured in VE-2 at the same depth.			
						Borehole backfilled with cement bentonite grout.			

R&M EIE, Inc

SOIL BORING AND WELL INSTALLATION AND VISUAL CLASSIFICATION LOG

Project Name: IWTP360 Closure Confirmation Sampling

Job Number: R&M 2009

Boring Number: IWTP360- VE-03	Date Started: 3/4/04
Drilling Method: (Bold *one*) HSA Continuous Core/GeoProbe with Hydropunch/Hand Auger. **Vacuum Excavation with Hydropunch**	Date Completed: 3/5/04
	Logged By: Ramesh Shah, R.G.
Outer Diameter of Boring: 4 Inch +	Drilling Subcontractor: Vironex Environmental Field Services
Inner Diameter of Well Casing:	Driller: Brandon Penera
Depth to Water (ft./bgs.) Initial approximately 4 ft below ground surface	Location Sketch: Outside fenced area

Note Sample ID number prefix is 033-IWTP360-

Time	Depth (ft) bgs	Drive Interval	Recovered Interval	Sample ID	Blow Count per six inches	Description	USCS soil symbol	Well construction	OVM (ppm)
						7.5-inch thick cement concrete			
2:35 3/4/04	2. 5		–	018	–	2.5' to 3', 5 YR 2/4 brown medium SAND poorly graded, loose, moist and micaceous	SP		0.0
8:45 3/5/04	4		–	– 019	–	4'-2" to 4'-8" 10 YR 2/3 Dark gray medium SAND, poorly graded, loose moist	SP		0.0
			–	–	–	Hydropunched the vacuum excavation hole and collected groundwater (020) sample from 7 ft to 9 ft screen interval. Groundwater sample was collected from 1" diameter temporary well.			
			–	–	–	The first borehole VE-03 was abandoned as some kind of yellow pipe was noticed at 2.5-ft depth. The abandoned hole was designated VE-3A and another hole, VE-3B, was used to collect groundwater sample.			
						Both boreholes were backfilled with cement bentonite grout and the core plugs were reinstalled and cemented on the top of grouted borehole.			

R&M EIE, Inc

SOIL BORING AND WELL INSTALLATION AND VISUAL CLASSIFICATION LOG

Project Name: IWTP360 Closure Confirmation Sampling

Job Number: R&M 2009

Boring Number: IWTP360- VE-04	Date Started: 3/4/04
Drilling Method: (Bold *one*) HSA Continuous Core/GeoProbe with Hydropunch/Hand Auger. **Vacuum Excavation with Hydropunch**	Date Completed: 3/5/04
	Logged By: Ramesh Shah, R.G.
Outer Diameter of Boring: 4 Inch +	Drilling Subcontractor: Vironex Environmental Field Services
Inner Diameter of Well Casing:	Driller: Brandon Penera
Depth to Water (ft./bgs.) Initial approximately 4 ft below ground surface	Location Sketch: Outside fenced area

Note Sample ID number prefix is 033-IWTP360-

Time	Depth (ft) bgs	Drive Interval	Recovered Interval	Sample ID	Blow Count per six inches	Description	USCS soil symbol	Well construction	OVM (ppm)
						7.5-inch thick cement concrete			
15:35	2.5			021		2.5' to 3', 5 YR 2/4 brown medium SAND poorly graded, loose, moist and micaceous	SP		0.0
	4			022		4.0' to 4.5' 10 YR 2/3 Dark brown medium SAND, poorly graded, loose moist, piece of hard rock at 4 ft depth.	SP		0.0
						Hydro punched the vacuum excavation hole and attempted to collect groundwater sample from 8 ft to 10 ft screen interval.			
				023		Borehole was backfilled with cement bentonite grout and the core plug was reinstalled and cemented on the top of grouted borehole.			

R&M EIE, Inc

SOIL BORING AND WELL INSTALLATION AND VISUAL CLASSIFICATION LOG

Project Name: IWTP360 Closure Confirmation Sampling

Job Number: R&M 2009

Boring Number: IWTP360- VE-05	Date Started: 3/4/04
Drilling Method: (Bold *one*) HSA Continuous Core/GeoProbe with Hydropunch/Hand Auger. **Vacuum Excavation with Hydropunch**	Date Completed: 3/5/04
	Logged By: Ramesh Shah, R.G.
Outer Diameter of Boring: 4 Inch +	Drilling Subcontractor: Vironex Environmental Field Services
Inner Diameter of Well Casing:	Driller: Brandon Penera
Depth to Water (ft./bgs.) Initial approximately 4 ft below ground surface	Location Sketch: Outside fenced area
Note Sample ID number prefix is 033-IWTP360-	

Time	Depth (ft) bgs	Drive Interval	Recovered Interval	Sample ID	Blow Count per six inches	Description	USCS soil symbol	Well construction	OVM (ppm)
						7.5-inch thick cement concrete			
15:35	2.5		–	024	–	2.5' to 3', 5 YR 2/4 brown medium SAND poorly graded, loose, moist and micaceous	SP		0.0
	4		–	025	–	4.5' to 5.0' 10 YR 2/3 Dark brown medium SAND, poorly graded, loose moist, piece of hard rock at 4-ft depth.	SP		0.0
			–	–	–	Hydropunched the vacuum excavation hole and attempted to collect groundwater sample from 8 ft to 10 ft screen interval. Groundwater recharge was very slow, and there was not enough water for sampling. Groundwater sample was not collected.			
			–	–	–	Borehole was backfilled with cement bentonite grout and the core plug was reinstalled and cemented on the top of grouted borehole.			

R&M EIE, Inc

SOIL BORING AND WELL INSTALLATION AND VISUAL CLASSIFICATION LOG

Project Name: IWTP360 Closure Confirmation Sampling

Job Number: R&M 2009

Boring Number: IWTP360- VE-06	Date Started: 3/5/04
Drilling Method: (Bold *one*) HSA Continuous Core/GeoProbe with Hydropunch/Hand Auger. **Vacuum Excavation with Hydropunch**	Date Completed: 3/5/04
	Logged By: Ramesh Shah, R.G.
Outer Diameter of Boring: 4 Inch +	Drilling Subcontractor: Vironex Environmental Field Services
Inner Diameter of Well Casing:	Driller: Brandon Penera
Depth to Water (ft./bgs.) Initial approximately 4 ft below ground surface	Location Sketch: Outside fenced area

Note Sample ID number prefix is 033-IWTP360-

Time	Depth (ft) bgs	Drive Interval	Recovered Interval	Sample ID	Blow Count per six inches	Description	USCS soil symbol	Well construction	OVM (ppm)
						7.5-inch thick cement concrete			
12:30	2.5		–	027	–	2.5' to 3', 7.5 YR 2/4 dark brown medium SAND with silt poorly graded, loose, moist and micaceous	SP		0.0
	4		–	028	–	4.5'-5' 7.5 YR 2/5 brown medium SAND, poorly graded, loose moist, piece of hard rock at 4 ft depth.	SP		0.0
			–	–	–	Hydropunched the vacuum excavation hole and collected groundwater samples from 8 ft to 10 ft screen interval, including one duplicate sample. 029, 030			
			–	–	–	Borehole was backfilled with cement bentonite grout and the core plug was reinstalled and cemented on the top of grouted borehole.			

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R&M ENVIRONMENTAL
AND INFRASTRUCTURE ENGINEERING, INC.

R&M Daily Activity Report
IWTP 360 CLOSURE CONFIRMATION SAMPLING
ALAMEDA POINT, ALAMEDA, CALIFORNIA

Date: 03/03/2004
Weather/Temp: Sunny; Partly Cloudy
Start/Finish Time: 7:30 a.m. to 5:25 p.m.
R&M Personnel Onsite: Ramesh Shah, Sara Hagerty, Shawn Vaughn
Contractors & and Personnel Onsite: Vironex (Brandon Penera); Concrete Wall Sawing (Curt)
Equipment used by Contractor: Geoprobe, concrete cutting saw
Equipment used by R&M: PID, digital camera, and hand pump and in-line filter for sample filtration
Other Personnel/Site Visitors: Brad Shelton (TtEMI), Doug Delong (Navy), Wendell Pierce (GEOTOP; R&M's surveying subcontractor)
Location of Field Activities: 1800 Orion Street and vicinity.

Summary of Field Activities:

- Mobilized equipment and supplies to site
- Held health and safety tailgate meeting
- Inspected drill rig and documented inspection on USACE Form 385
- Saw cut concrete on location IWTP360-VE03
- Advanced boring at locations DP01, DP02, DP03, and DP04
- Encountered refusal at 1.5 ft bgs when attempted drilling at DP-02. Moved DP-02 location 1 ft to the west; no refusal was encountered at this new location.
- Collected a total of 4 soil samples and 4groundwater samples, as follows:

Boring Location.	Sample # (Media; sample depth, ft bgs)
DP01	033-IWTP360-001 (Soil; 1.5'-2') 033-IWTP360-002 (Soil; 4.5'-5')
DP02	033-IWTP360-003 (Soil; 2') 033-IWTP360-004 (Soil; 5')
DP03	033-IWTP360-007 (Water; 5.5') 033-IWTP360-008 (Water; 10.5')
DP-04	033-IWTP360-009 (Water; 6') 033-IWTP360-011 (Water, Duplicate; 6')

bgs = Below ground surface

- Prepared/labeled sample containers, packaged them, placed samples in coolers with ice, and completed chain-of-custody forms and other sample documentation. Samples for hexavalent chromium analysis were delivered (by Brad Shelton of TtEMI) to Curtis and Tompkins Laboratory in Berkeley, CA. Samples for CLP metals and molybdenum will be sent to APCL laboratories for analysis.

- Contained all IDW s in 55-gallon drums, labeled drums and temporary stored them on site, pending profiling and ultimate disposal.

Problem encountered and solutions:

- Refusal encountered at 1.5 ft when drilling at location DP-02; drilling was successful when relocated DP-02 about 1 ft to the west.

- Filtration of groundwater was not successful when using a hand pump(due to excessive pressure buildup and significant reduction in flow); brought in in-line filters from R&M office and the system worked properly.

- The sample bottles did not arrive at the site on time and this created some delays.

- Steam cleaner for decontamination of screens broke down and could not be re-started. This prevented the work planned for today to be completed. Pending fixing of the steam cleaner, the Geoprobe will be brought to site tomorrow (03/04/04) to complete work.

Deviation from Work Plan: None

Future work: Advance borings at remaining locations and collect soil and groundwater samples.

Photographs: See pages that follow.

Employee's Signature: ________________ **Date:** ___________

Photo #1. The saw cut/cored concrete at VE03

Photo #2 – Using a steam cleaner to decontaminate the screen used in water sampling

Photo #3 – Collection of water samples at DP-03 using an in-line filter

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R&M ENVIRONMENTAL
AND INFRASTRUCTURE ENGINEERING, INC.

R&M Daily Activity Report
IWTP 360 CLOSURE CONFIRMATION SAMPLING
ALAMEDA POINT, ALAMEDA, CALIFORNIA

Date: 03/04/2004
Weather/Temp: Sunny
Start/Finish Time: 8:00 a.m. to 5:30 p.m.
R&M Personnel Onsite: Ramesh Shah, Sara Hagerty, Shawn Vaughn
Contractors and Personnel Onsite: Vironex (Brandon Penera, Sean)
Equipment used by Contractor: Geoprobe, vacuum excavation rig, steam cleaner, hand auger
Equipment used by R&M: PID, digital camera, peristaltic pump, in-line filter for water sample filtration, slide hammer for soil sample collection
Other Personnel/Site Visitors: Brad Shelton (TtEMI), Gregory Grace & Bob Perricone (Navy), Dot Lofstrom (DTSC), Mike Morton & Tim McGrinty (Vironex personnel onsite for surprise internal health and safety audit)
Location of Field Activities: 1800 Orion Street and vicinity.

Summary of Field Activities:

- Mobilized equipment and supplies to site
- Held health and safety tailgate meeting
- Inspected drilling equipment and documented inspection on USACE Form 385; also, filled out the checklist provided by the Navy
- Punched through asphalt on VE01 & VE02 with Geoprobe rig (Photograph 1).
- Advanced borings at locations VE01, VE02, and VE03.
- Sampled for groundwater at previous day's boring location DP02 (Photograph 2).
- Collected a total of 6 soil samples, 2 groundwater samples, 1 source blank sample, and 1 equipment rinse water sample as follows:

Boring Location.	Sample # (Media; sample depth, ft bgs)
VE01	033-IWTP360-012 (Soil; 3'-3.5') 033-IWTP360-013 (Soil; 4'-4.5')
VE02	033-IWTP360-015 (Soil; 3'-3.5')
VE03	033-IWTP360-018 (Soil; 2'-2.5')
VE04	033-IWTP360-021 (Soil; 3'-3.5') 033-IWTP360-022 (Soil; 4'-4.5')
DP02	033-IWTP360-005 (Water; 11')
N/A	033-IWTP360-031 (Water; Source Blank) 033-IWTP360-032 (Water; Equipment Rinse)

bgs = Below ground surface

- Prepared/labeled sample containers, packaged them, placed samples in coolers with ice, and completed chain-of-custody forms and other sample documentation. Samples for hexavalent chromium analysis were delivered (by Brad Shelton of TtEMI) to Curtis and Tompkins Laboratory in Berkeley, CA. Samples for CLP metals and molybdenum were kept with Brad Shelton in coolers to be sent to APCL laboratories for analysis.

- Grouted and filled borings DP01, DP02, and DP03.

- Contained all IDWs in labeled 55-gallon drums temporarily stored onsite, pending profiling and ultimate disposal.

Problem encountered and solutions:

- Refusal encountered at 4.5 ft while vacuum excavating locations VE01 and VE02. We attempted to widen VE02 slightly to the south (Photograph 3) in order to bypass the refusal area, but again were only able to get down 4.5 ft. We were not able to determine the cause of the refusals at VE01 and VE02. Brad Shelton requested boring to cease at these locations fearing that refusal was caused by a clay pipe known to run through the area. Samples were not collected at these locations below 4.5 ft.

- A possible gas pipeline was encountered at boring location VE03 approximately 3 ft down (Photograph 4). The Underground Service Alert (USA) and the Navy were informed of the discovered pipe. Brad Shelton requested this hole be abandoned and a new boring made adjacent to it on 3/5/04.

- A hard rocky layer was encountered at a depth of 4-4.5 ft at VE04. After gaining approval from Brad Shelton this layer was pushed through with a hydropunch, groundwater samples from this location will be collected on 3/5/04.

- Work with the vacuum excavation unit was occasionally slowed due to sand clogging the hose.

Deviation from Work Plan: Some deviations from work plan were necessary due to unanticipated field conditions. Examples:

- Did not collect groundwater samples at VE-01 and VE-02

- Could not collect the deep groundwater sample at DP-04 (water was not present at a depth of 8 ft)
- At VE-03 collected only one sample (at 3 ft); could not penetrate deeper because of an obstacle (presence of cable/wire)

Future work:

- Advance borings at remaining locations, collect soil and groundwater samples, grout and fill finished borings.
- Ship coolers containing samples for CLP metals and molybdenum analysis to APCL laboratories (this will be done by Brad Shelton)
- Transfer all drums containing IDWs to the "Shaw Group's" onsite nearby temporary waste storage area; profile the wastes, and arrange for their disposal

Photographs: See pages that follow.

Employee's Signature: ________________ **Date:** ___________

Photograph 1. Geoprobe punching through asphalt at VE02

Photograph 2. Groundwater sampling at DP02

Photograph 3. Widening of VE02 to the south in an attempt to bypass refusal area

Photograph 4. Uncovered pipe in VE03

7996 Capwell Drive
Oakland, CA 94621-2015
Telephone: (510) 553-2144
Fax: (510) 553-2145

R&M ENVIRONMENTAL
AND INFRASTRUCTURE ENGINEERING, INC.

R&M Daily Activity Report
IWTP 360 CLOSURE CONFIRMATION SAMPLING
ALAMEDA POINT, ALAMEDA, CALIFORNIA

Date: 03/05/2004
Weather/Temp: Sunny
Start/Finish Time: 7:30 a.m. to 6:30 p.m.
R&M Personnel Onsite: Ramesh Shah, Sara Hagerty
Contractors and Personnel Onsite: Vironex (Brandon Penera, Sean Borrowman), TtEMI (Brad Shelton)
Equipment used by Contractor: Geoprobe, vacuum excavation rig, steam cleaner, hand auger, slide hammer (hand sampler) for soil sample collection
Equipment used by R&M: PID, digital camera, peristaltic pump, in-line filter for water sample filtration, water level indicator
Other Personnel/Site Visitors: Gregory Grace & Bob Perricone (ROICC, Navy), Doug Delong (Navy)
Location of Field Activities: 1800 Orion Street and vicinity.
Summary of Field Activities:

- Mobilized equipment and supplies to site
- Held health and safety tailgate meeting
- Inspected drilling equipment and documented inspection on USACE Form 385; also, filled out the machinery mobile equipment checklist provided by the Navy. Navy provided one more new checklist for drilling equipment in the afternoon, which was filled out for the Geoprobe rig (3 checklists total). Government Inspector Gregory Grace and Mr. R Perricone inspected drill rig and reviewed and approved completed checklist for equipment and daily checklist for onsite equipment.
- Added a new location to the north of VE02, per TtEMI, to allow collection of a water sample which we were unable to collect at VE01 and VE02. This location was Hydropunched and designated DP05. Two soil samples and one water sample were collected.
- Saw cut new location for VE03, renamed it VE03B, since VE03 (original) was located over a possible gas line. Collected deep soil sample 033-IWTP360-019 @ 1045. Direct pushed VE03 (for a second time) and installed a temporary piezometer to collect water sample. Collected one water sample after several attempts
- Vacuum excavated VE05 and VE06, for a total of 3 vacuum excavation locations for the day.
- Brad Shelton of TtEMI decided that after the several unsuccessful attempts to collect water at DP04 (deep zone), no water sample will be collected at this location. A temporary 1" diameter PVC monitoring well was installed with 2 feet of screen, from 10' to 12' bgs. Groundwater level was 4.95' bgs. However the water `was muddy and not enough to collect groundwater samples.
- Grouted all sample locations and abandoned borehole locatoions. For the locations which were saw cut, plugged with concrete saw cut pieces and grouted around them.
- Water sample for VE05 could not be collected, water was far too silty and turbid to pass through filter, after attempting all day

- ➢ Contacted the laboratory to see if we could collect a smaller volume of water for hexavalent chromium analysis; the laboratory indicated that a 250-ml volume would be acceptable.
- ➢ Removed soil from and decontaminated the vacuum excavation truck. Contained soil cuttings in 1 55-gallon drum.
- ➢ Moved 1 water and 2 soil labeled 55-gallon drums to the Shaw Group's on-site IDW storage area (Building 112) for profiling and disposal
- ➢ Overall, a total of 7 soil samples and 5 groundwater samples were collected. Sample locations, sample depths, and sample numbers are as follows:

Boring Location	Sample #	Sample Depth, Media
DP05	033-IWTP360-034	1.5 – 2.0 Soil
DP05	033-IWTP360-035	4.0 – 4.5 Soil
DP05	033-IWTP360-036	8 Groundwater
VE03 B	033-IWTP360-019	4.16 – 4.66 Soil
VE03 B	033-IWTP360-020	7 Groundwater
VE04	033-IWTP360-023	8 – 10 Groundwater
VE05	033-IWTP360-024	2.5 – 3 Soil
VE05	033-IWTP360-025	4.5 – 5 Soil
VE05	033-IWTP360-026	Not collected
VE06	033-IWTP360-027	2.5 – 3 Soil
VE06	033-IWTP360-028	4.5 – 5 Soil
VE06	033-IWTP360-029	8 – 10 Groundwater
VE06	033-IWTP360-030	8 – 10 Groundwater

bgs = Below ground surface

- ➢ Prepared/labeled sample containers, packaged them, placed samples in coolers with ice, and completed chain-of-custody forms and other sample documentation. Samples for hexavalent chromium analysis were delivered (by Brad Shelton of TtEMI) to Curtis and Tompkins Laboratory in Berkeley, CA. Samples for CLP metals and molybdenum were kept with Brad Shelton in coolers to be sent to APCL laboratories for analysis.

Problems encountered and solutions:

- ➢ The work plan states that water would be collected, but does not clearly define how a "well" would be created. We decided to direct push from 5 – 8 feet and install a temporary piezometer. This called for a Geoprobe to be on site for all three days of field activities.
- ➢ We met refusals on VE01 and VE02, so it was decided that a new location would be added, DP05, and would utilize the Hydropunch.
- ➢ Water sample was very difficult to collect, which required additional staff time for sampling. All staff moved from location to location attempting to collect water. We used the Hydropunch direct push with a piezometer, hand bailing, and peristaltic pumping were employed to facilitate water sampling.
- ➢ At VE05, water sample could not be collected due to the turbidity and siltiness of the water.
- ➢ Contacted the lab that would analyze samples for hexavalent chromium to see if we can collect a smaller volume of water for chromium analysis. Was told that 250 mL of water would be adequate and so we collected 250 ml of water.

Deviations from Work Plan: Some deviations from work plan were necessary due to unanticipated field conditions. Examples:

- VE01 and VE02 locations are not in order from west to east as shown on Figure 5 of the workplan. VE01 is closest to fence and corner of Building 163A, and VE02 is south of the excavation, all others are in order moving from west to east We started with VE01 sample numbers, but started on location VE02 in field. The figure in the workplan does not give a designation for location numbers and was at our discretion
- Did not collect groundwater samples at DP04 (deep water) and VE05 because no water was encountered at DP04 and the water was too turbid and silty to filter at VE-05 (as well as DP05 had very little water).
- Collected only 1 equipment rinsate (per Brad Shelton of TtEMI)
- Moved VE03 to a location east of the existing location due to the obstruction in the first location, as stated in 03/04/04 daily log
- Added location DP05, sampled for soil and groundwater
- Daily logs to be forwarded to ROICC, per their request (even though this was not stipulated in the work plan)
- Contacted the lab that would analyze samples for hexavalent chromium to see if we can collect a smaller volume of water for that chromium analysis. Was told that 250 mL of water would be adequate and so we collected 250 ml of water.

Future work:

Except for waste profiling and disposal and surveying of the sampling locations, which are in progress, field activities have been completed per the original schedule. Mr. Brad Shelton of TtEMI will ship coolers containing samples for CLP metals and molybdenum analysis to APCL laboratories

Photographs: See pages that follow.

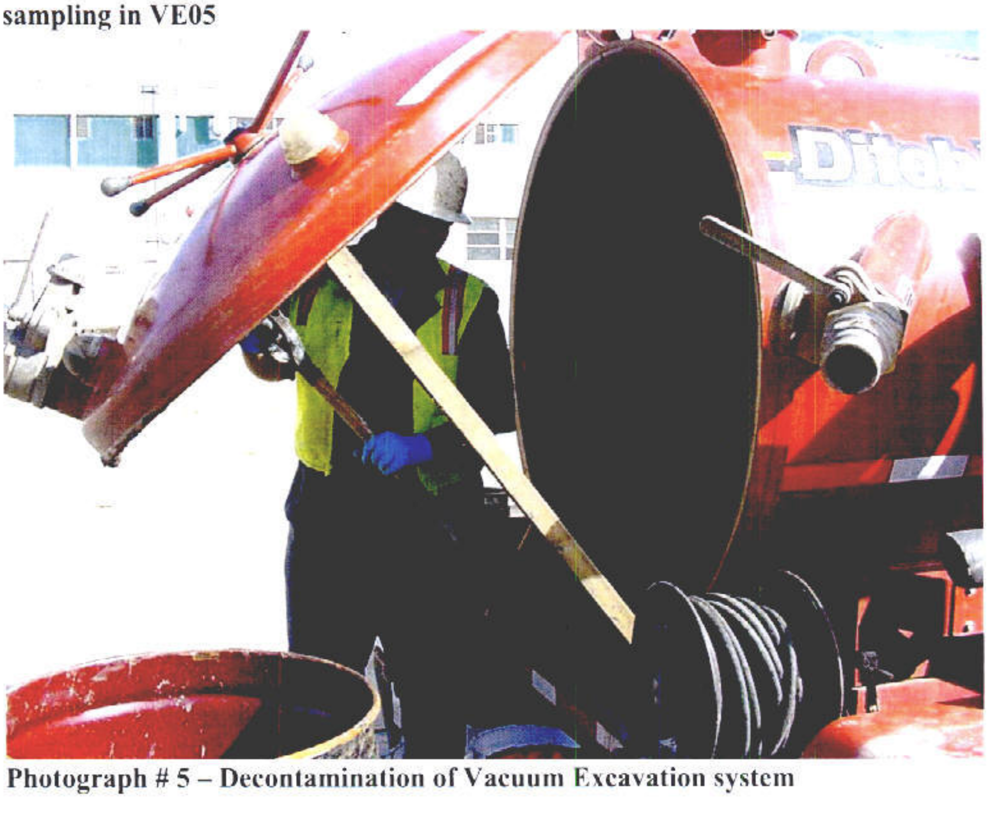
Employee's Signature: ____________________________ **Date:** ___________

Photograph #1 – Downhole photograph of VE02, which shows the widening required to attempt to see the obstruction in hole at approximately 5 feet

Photograph # 2 – Downhole of VE01, which shows the general shape the vacuum excavation creates.

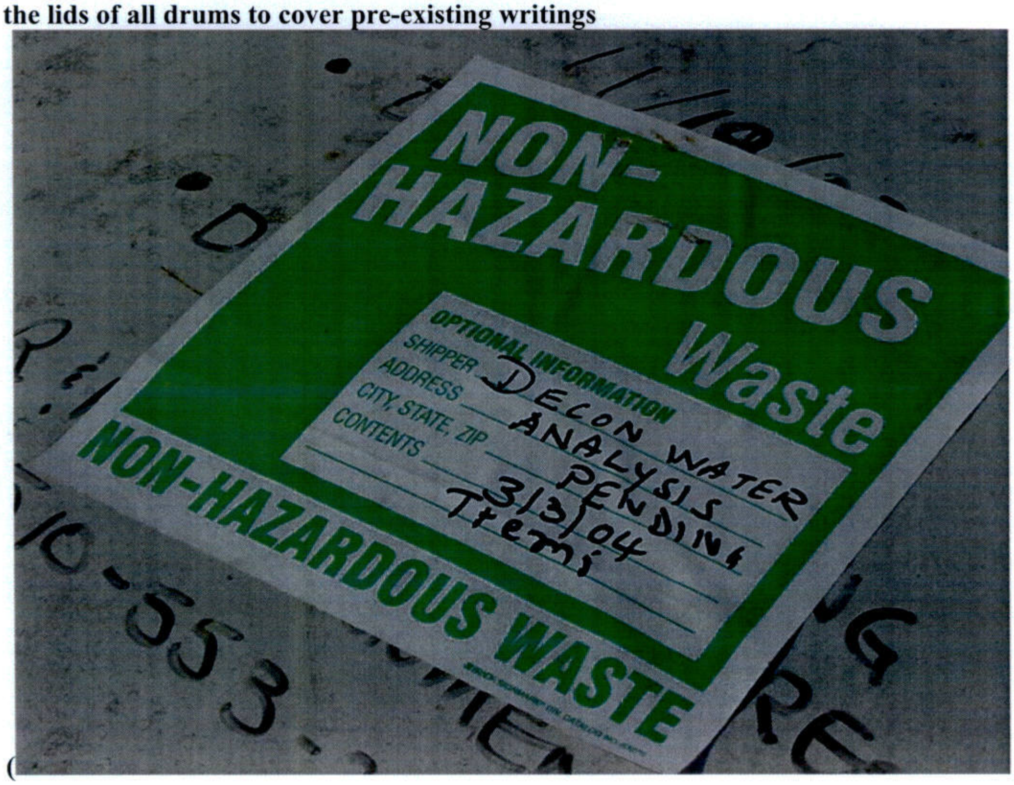
Photograph # 3 – Soil sampling of VE05

Photograph # 4 – Geoprobe used to drive down and insert a temporary well for water sampling in VE05



Photograph # 5 – Decontamination of Vacuum Excavation system

Photograph # 6 – Labeled drums awaiting profiling and disposal, the labels are placed on the lids of all drums to cover pre-existing writings



Photograph # 7 – Label on drums awaiting disposal

ENTERED

P.U.C #167667
EPA #CAD981692809 26
Hazardous Waste Hauler #1415

Date 3 / 25 /19 04

TRUCK NO. 60 TRAILER NO. —

SUB. HAULER

Dillard Trucking, Inc. dba
Dillard Environmental Services

P.O. BOX 579
BRYON, CA 94514
(925) 634-6850

SHIPPING ORDER and FREIGHT BILL
76604

PRIME CARRIER	Dillard	JOB NO. 3011-001	CONSIGNEE Clean Harbors
SHIPPER	R & M ENV.		DESTINATION Berryessa
POINT OF ORIGIN	399 W. Seaplane Lagoon St.		CITY San Jose CA
CITY	Alameda CA,		BEGINNING MILEAGE 264988 / ENDING MILEAGE 265143

NO	MANIFEST NO.	YARDS OR WEIGHT	LOADING TIME ARRIVE	LOADING TIME LEAVE	UNLOADING TIME ARRIVE	UNLOADING TIME LEAVE
1	32300		820Am	910Am	1000Am	1029
2			1145Am			
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						

FUEL – GALLONS #1	FUEL – GALLONS #2	FUEL – VENDOR #1	FUEL – VENDOR #2
20 Gallons			

OFFICE USE ONLY

TRANS.	6
TNS / HRS / LDS / YDS	6
RATE	$ 90 —
SUBTOTAL	$
DISPOSAL	Water 1 Drum @ 75
UNITS:	Soil 8 Drums @ 60
RATE:	

RECEIVED
MAR 29 2004
BY:

14 COMMENTS:
15
16
17

START 630 AM	STOP 1230 PM	DEDUCT TIME ∅	NET TIME 6 HRS.	TOTAL CHARGES $
DRIVER Hugo Sanchez				
RECEIVED	DATE	APPROVED BY	APPROVED (PAYROLL)	DATE

MAKE DELIVERIES INSIDE THE CURB LINE AND ON THE LOT AT THE CUSTOMER'S RISK ONLY AND ACCEPT NO RESPONSIBILITY FOR DAMAGES RESULTING FROM SUCH DELIVERIES.
ALL BILLS DUE AND PAYABLE BY THE 10TH OF THE MONTH. A 1-1/2% PER MONTH CHARGED ON PAST DUE ACCOUNTS. THIS IS AN ANNUAL PERCENTAGE RATE OF 18%. CUSTOMER WILL BE RESPONSIBLE FOR ALL COURT AND ATTORNEY COSTS FOR COLLECTION

NON-HAZARDOUS WASTE MANIFEST

15674

Please print or type (Form designed for use on elite (12 pitch) typewriter)

NON-HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No. CAZ170023236	Manifest Document No. 32300	2. Page 1 of 1

3. Generator's Name and Mailing Address

NAVY ROICC
ALAMEDA POINT
ALAMEDA, CA 94501

MAIL: NAVY ROICC
2450 SARATOGA STREET
ALAMEDA, CA 94501
ATTN:

4. Generator's Phone ( )

5. Transporter 1 Company Name: DILLARD ENVIRONMENTAL SVCS	6. US EPA ID Number: CAD982523433	A. State Transporter's ID B. Transporter 1 Phone (925)634-6850
7. Transporter 2 Company Name	8. US EPA ID Number	C. State Transporter's ID D. Transporter 2 Phone
9. Designated Facility Name and Site Address: Clean Harbors Environmental, 1021 Berryessa Road, San Jose, CA 95133	10. US EPA ID Number: CAD059494310	E. State Facility's ID F. Facility's Phone (408)451-5000

11. WASTE DESCRIPTION	12. Containers No.	Type	13. Total Quantity	14. Unit Wt./Vol.
a. NON HAZARDOUS, NON REGULATED WASTE, (water), (pf: CH41723)	1	DM	55 ~~GALLONS~~	G
b. NON HAZARDOUS NON REGULATED WASTE, (soil), (pf: CH42225)	2	DM	110 ~~GALLONS~~	P
c.				
d.				

G. Additional Descriptions for Materials Listed Above

11a. CH41723
11b. CH42225
11c.
11d.

DJ759696

H. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

Emergency Contact (925)634-6850 DILLARD ENV

GENERATOR

16. GENERATOR'S CERTIFICATION: I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

Printed/Typed Name	Signature	Date Month Day Year
Gregory J. Grace	Gregory J. Grace	03 26 04

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month Day Year
HUGO SANCHEZ	[signature]	03 26 04

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator; Certification of receipt of the waste materials covered by this manifest, except as noted in item 19.

Printed/Typed Name	Signature	Date Month Day Year
Melanie Ashford	Melanie Ashford	03 26 04

NON-HAZARDOUS WASTE

NON-HAZARDOUS WASTE MANIFEST

Please print or type (Form designed for use on elite (12 pitch) typewriter)

NON-HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No.	Manifest Document No. 32300	2. Page 1 of 1

3. Generator's Name and Mailing Address

NAVY ROICC
ALAMEDA POINT
ALAMEDA, CA 94501

MAIL: NAVY ROICC
2450 SARATOGA STREET
ALAMEDA, CA 94501
ATTN:

4. Generator's Phone ( ) -

5. Transporter 1 Company Name: DILLARD ENVIRONMENTAL SVCS.	6. US EPA ID Number: CAD982523433	A. State Transporter's ID
		B. Transporter 1 Phone (925)634-6850
7. Transporter 2 Company Name	8. US EPA ID Number	C. State Transporter's ID
		D. Transporter 2 Phone
9. Designated Facility Name and Site Address: Clean Harbors Environmental, 1021 Berryessa Road, San Jose, CA 95133	10. US EPA ID Number: CAD059494310	E. State Facility's ID
		F. Facility's Phone (408)451-5000

11. WASTE DESCRIPTION	12. Containers No.	Type	13. Total Quantity	14. Unit Wt./Vol.
a. NON HAZARDOUS, NON REGULATED WASTE, (water), (pf: CH41723)		DM		G
b. NON HAZARDOUS NON REGULATED WASTE, (soil), (pf: CH42225)		DM		P
c.				
d.				

G. Additional Descriptions for Materials Listed Above

11a. CH41723
11b. CH42225
11c.
11d.

H. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

Emergency Contact (925)634-6850 DILLARD ENV

16. **GENERATOR'S CERTIFICATION:** I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

Printed/Typed Name	Signature	Date Month	Day	Year

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month	Day	Year

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month	Day	Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of the waste materials covered by this manifest, except as noted in Item 19.

Printed/Typed Name	Signature	Date Month	Day	Year

GENERATOR

TRANSPORTER

FACILITY

NON-HAZARDOUS ..ASTE

RESPONSE TO COMMENTS

RESPONSE TO DTSC COMMENTS
ON THE NAVY'S RESPONSE TO DTSC'S FIRST SET OF COMMENTS ON:

Draft Amendment Closure Summary Report (dated March 2006)
Industrial Waste Treatment Plant 360, Alameda Point, Alameda, CA

DTSC Review Comments dated October 27, 2006 from Buck King, PG, CHG, Engineering Geologist, and Brian Lewis, CHG, CEG, Senior Engineering Geologist, Geology, Permitting, and Corrective Action Branch, Hazardous Waste Management Program

Specific Comments and Recommendation 1:
The GSU Recommended that the soil characterization data presented in the Closure Summary Report be re-organized to present conditions in the 0 to 2 foot depth range, and the 0 to 10 foot depth range, in order to support risk assessment evaluation. The revised evaluation should include a statistical comparison of site soil data to background soil data. Instances where statistical comparison can not be made due to insufficient data or censored data should be noted.

The Navy response to GSU Recommendation 1 was that the existing soil characterization data will be used to identify either the maximum value or the 95% Upper Confidence Limit using Human and Ecological Risk Division (HERD) recommended depth intervals of 0 to 1 foot and 0 to 10 feet.

The Navy response to GSU Recommendation 1 did not specifically describe how the revised document would address soil background inorganic data evaluation or the completeness and appropriateness of soil background inorganic dataset. The GSU considers the Navy's response to be incomplete and silent on the issue of soil background chemistry data source and its appropriateness for use at IWTP 360.

RESPONSE TO COMMENT 1:
The Navy provided specific descriptions and examples of how the soil background data would be re-evaluated with the RTC to HERD's Specific Comment 5 that were included along with GSU's RTCs. This attachment is provided again for your reference.

Specific Comments and Recommendation 2:
The GSU recommends that groundwater data used to characterize the site include the results from well M04-05. The well M04-05 is approximately 30 feet down gradient of the vitrified clay pipe lines associated with IWTP 360, and is considered representative of groundwater conditions associated with the regulated unit. The revised report should include a revised statistical evaluation of site groundwater data compared to background groundwater data.

The Navy response to GSU Recommendation 2 was that data from well M04-05 should not be included in the characterization of the IWTP 360 because M04-05 is included in an ongoing base-wide groundwater investigation under the CERCLA program.

The GSU considers the Navy's response incomplete and silent on the issue of statistically evaluating groundwater inorganic chemistry data and comparing it to background data. The GSU is interested in inorganic chemistry results including lead, copper, cadmium, total chromium, and hexavalent chromium data. The GSU does not agree with the argument that the CERCLA administrative program precludes the use of data from well M04-05. The data from well M04-05 will support the understanding groundwater chemical conditions in the IWTP 360 area. The GSU does not agree with the Closure Summary Report interpretations that cadmium and hexavalent chromium levels in groundwater beneath IWTP 360 are the result of background conditions the GUS is interested in the basis for interpreted background levels and in the Navy's interpretation of groundwater conditions in the IWTP 360 area.

RESPONSE TO COMMENT 2:
The GSU comments suggests results for monitoring well MW04-05 are "considered representative of groundwater conditions associated with the regulated unit". The Navy disagrees with this assertion; rather the Navy considers the results for MW04-05 representative of Building 360 located upgradient of MW04-05 and IR Site 3 Group rather than the regulated unit.

Recent results from the spring 2006 groundwater monitoring performed as part of the Alameda Basewide Annual Groundwater Monitoring Program (conducted under CERCLA) revealed chromium concentrations in groundwater of 21,000 ug/L from the second water bearing zone downgradient from Building 360 (monitoring well D03-03) but cross-gradient of the regulated unit. This supports the presence of a chromium source associated with Building 360 that would account for the chromium reported in MW04-05.

The Navy does not suggest the CERCLA administrative program precludes the use of data from well M04-05, rather, the Navy believes the results for MW04-05 are not representative of the regulated unit and its inclusion in the risk assessment may overstate the groundwater risks specifically associated with the regulated unit.

As indicated in Response to Comment 1 above, guidelines for evaluating site data versus background were provided as part of the response to HERD's Comment 5 (attached). This evaluation will be performed for the site groundwater results.

Specific Comments and Recommendation 3:
Recommendations. The GSU reiterates it previous recommendation that the soil characterization data presented in the Closure Summary Report is reorganized to support risk assessment evaluation. The revised evaluation should include a statistical comparison of site soil data to

background soil data. Instances where statistical comparison can not be made due to insufficient data or censored data should be noted.

The GSU also reiterates it previous recommendation that groundwater data used to characterize the site includes the results from well MW04-05. The Closure Summary Report should be revised to include an amended statistical evaluation of site groundwater data, including a comparison to background groundwater data, and be resubmitted to the Department for GSU review.

RESPONSE TO COMMENT 3:

As previously stated, a new background evaluation of the soil data is being performed using both graphical and numerical techniques, and the results will be used to update the chemicals of potential concern (COPC) for the site, and then in calculating the exposure point concentrations (EPCs) for the COPCs.

The Navy also reiterates its position that groundwater data from well M04-05 should not be included in the characterization of the regulated unit, but rather considered as part of the ongoing CERCLA activities relating to Building 360 and IR Site 3 Group, including the basewide long-term groundwater monitoring program and the upcoming remedial design data gap investigation for IR Site Group 3. Both of these CERCLA activities involve groundwater data collection and contaminant delineation that would lead to appropriate groundwater remedial actions. Coupled with the RCRA/CERCLA integration per the FFA, addressing M04-05 under the ongoing CERCLA actions is appropriate.

ATTACHMENT FOR
Response to the September 11, 2006
HERD Specific Comment 5

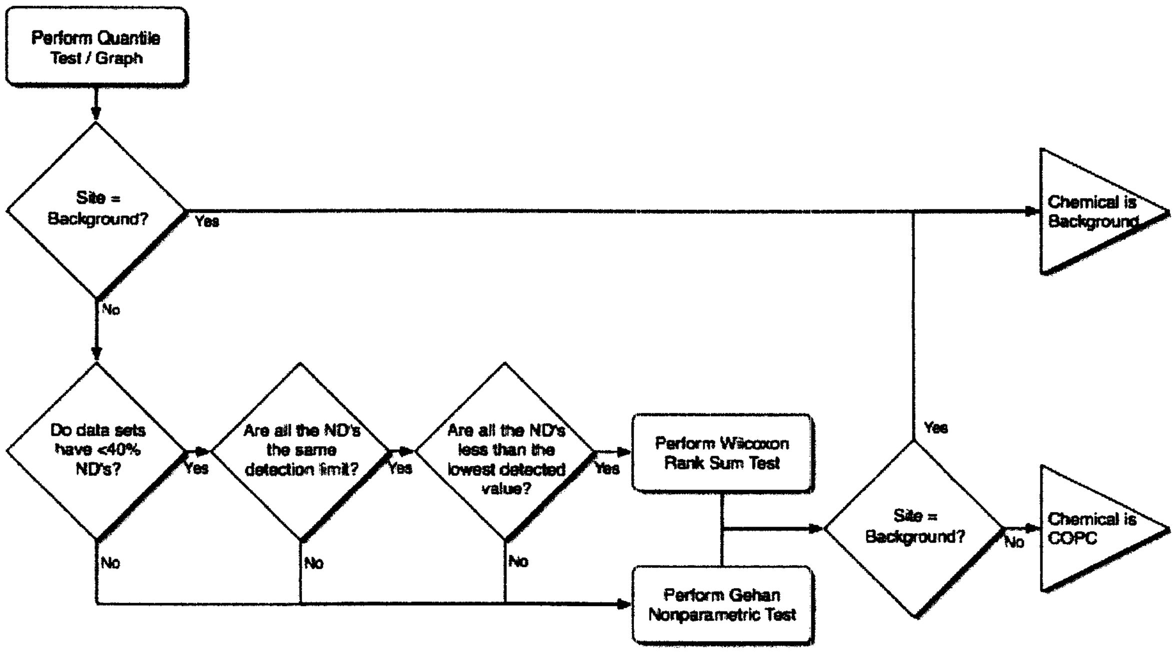
Procedure for Evaluating Site Chemical Data Against Background Data
IWTP360, Alameda Point, California

The site is located within the background area designated as "blue". The electronic data results were obtained from TtEMI that correspond to the samples used to develop the blue background data set, as identified in *Summary of Background Concentrations in Soil and Groundwater, Alameda Point*, by Tetra Tech EM Inc., dated December 2001.

As the constituents of interest are metals, and many of the metals include numerous non-detect values, comparison with background will center on a combination of graphical evaluations and nonparametric tests. A flow diagram of the proposed process is provided below:

An example analysis using the above process was performed for arsenic in soil, of particular interest at IWTP360.

Evaluating Site Data Against Background Data to Determine COPC

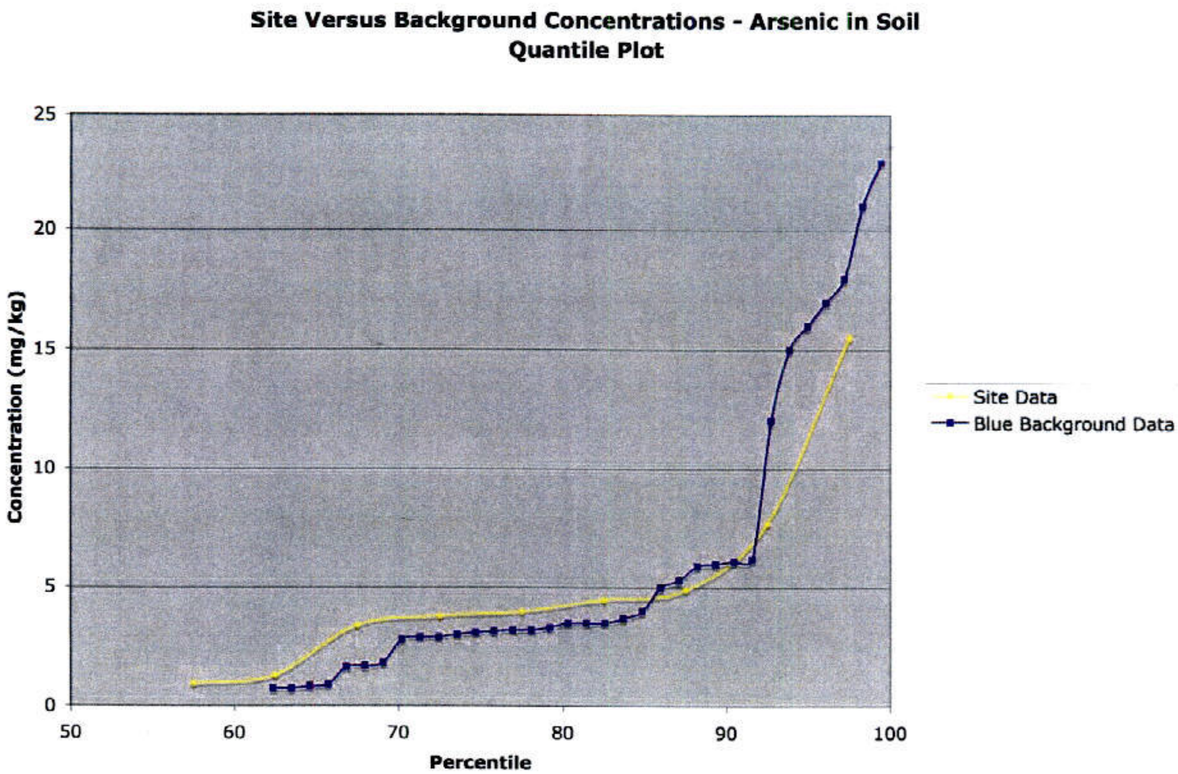


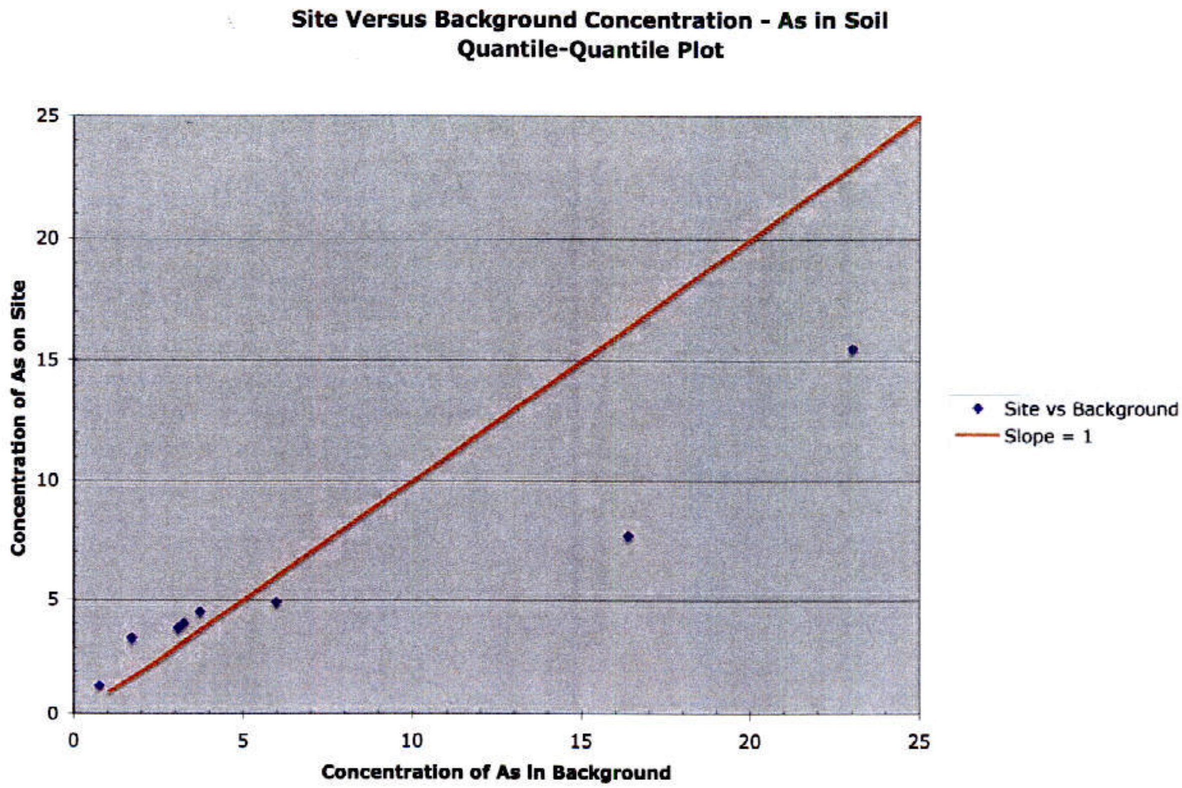
Basic Summary Statistics

Sample Set	No. Samples	No. NDs	% ND	Average (Detect Results)	Maximum
Blue Background	89	55	61.8%	6.19	23
Site Data	20	11	55.0%	5.12	15.5

Quantile Test / Graph

Several graphical methods were used to evaluate site versus background to determine the most efficient and effective method. Two approaches performed using excel on the raw data included a quantile plot and quantile-quantile plot comparing the blue background data to the site data, as shown below:





The results show quite clearly the site data falls well below background data in the higher concentration range. A quantile test was also performed on the data using ChemStat 6.1 (a software package designed specifically for evaluating chemical data for RCRA compliance). Results of this analysis indicated "*no statistical significance at 95% confidence level*".

Gehan Nonparametric Test

Due to the high percentage of NDs in the data set for arsenic in soil (greater than 50% for both background and site data sets), a Gehan Test was performed (again using ChemStat 6.1). The Gehan Statistic was 0.043, well below the criteria of 1.645, resulting in "*no statistical significance at 95% confidence level*". A copy of the output is provided below.

To validate these findings, given the high values found in the background data set, an outlier analysis was performed on the background data. Two potential outliers were identified. The site data passed the Gehan Test even after removing the potential outliers from the background data.

Gehan Non-Parametric Rank Test
Parameter: ARSENIC

Gehan Ranks

Point	Date	Result	d - e	Rank	a(R)
033-IWTP360-024	1/1/2000	ND<0.35	0 - 1	33.5	-43
B16-11	8/20/1998	ND<0.61 U	0 - 2	33.5	-43
B16-10	8/20/1998	ND<0.66 U	0 - 3	33.5	-43
B16-11	8/20/1998	ND<0.7 U	0 - 4	33.5	-43
M09-05	11/6/1998	ND<0.71 U	0 - 5	33.5	-43
B16-10	8/20/1998	ND<0.72 U	0 - 6	33.5	-43
M16-04	11/8/1998	0.74 J	1 - 6	37	-36
M16-04	11/8/1998	0.74 J	2 - 6	38	-34
B16-11	8/20/1998	ND<0.79 U	2 - 7	34.5	-41
B16-10	8/20/1998	ND<0.8 U	2 - 8	34.5	-41
M09-05	11/6/1998	0.84 J	3 - 8	40	-30
B16-12	8/20/1998	ND<0.88 U	3 - 9	35	-40
134-0014	1/1/2000	ND<0.88	3 - 10	35	-40
M09-05	11/6/1998	0.92 J	4 - 10	42	-26
134-0014M	1/1/2000	0.94	5 - 10	43	-24
033-IWTP360-019	1/1/2000	ND<1	5 - 11	36	-38
B16-12	8/20/1998	ND<1.2 U	5 - 12	36	-38
033-IWTP360-004	1/1/2000	ND<1.2	5 - 13	36	-38
134-0015M	1/1/2000	1.3	6 - 13	45.5	-19
B16-10	8/20/1998	ND<1.3 U	6 - 14	36.5	-37
033-IWTP360-003	1/1/2000	ND<1.4	6 - 15	36.5	-37
B16-12	8/20/1998	ND<1.4 U	6 - 16	36.5	-37
033-IWTP360-013	1/1/2000	ND<1.4	6 - 17	36.5	-37
B07C-11	8/18/1998	ND<1.5 U	6 - 18	36.5	-37
033-IWTP360-035	1/1/2000	ND<1.5	6 - 19	36.5	-37
MBG-3	5/30/1996	1.63	7 - 19	49.5	-11
MBG-3	5/30/1996	1.68	8 - 19	50.5	-9
033-IWTP360-001	1/1/2000	ND<1.7	8 - 20	37.5	-35
MBG-3	5/30/1996	1.8	9 - 20	52	-6
B07C-11	8/18/1998	ND<1.9 U	9 - 21	38	-34
B07C-11	8/18/1998	ND<1.9 U	9 - 22	38	-34
033-IWTP360-012	1/1/2000	ND<1.9	9 - 23	38	-34
MW410-1	7/2/1994	ND<1.9 U	9 - 24	38	-34
033-IWTP360-034	1/1/2000	ND<2	9 - 25	38	-34
B07C-12	8/18/1998	ND<2 U	9 - 26	38	-34
MW410-1	7/2/1994	ND<2.2 U	9 - 27	38	-34
033-IWTP360-021	1/1/2000	ND<2.3	9 - 28	38	-34
MW410-4	7/13/1994	ND<2.4 U	9 - 29	38	-34
MW410-1	7/2/1994	ND<2.4 U	9 - 30	38	-34
B410-9	7/13/1994	ND<2.4 U	9 - 31	38	-34
MW547-1	6/30/1994	ND<2.5 U	9 - 32	38	-34
MW410-4	7/13/1994	ND<2.5 U	9 - 33	38	-34
MW547-2	6/30/1994	ND<2.5 U	9 - 34	38	-34
MW547-1	6/30/1994	ND<2.5 U	9 - 35	38	-34
MW410-3	7/13/1994	ND<2.6 U	9 - 36	38	-34
B410-7	7/13/1994	ND<2.6 U	9 - 37	38	-34
MW547-2	6/30/1994	ND<2.7 U	9 - 38	38	-34
MW547-2	6/30/1994	ND<2.7 U	9 - 39	38	-34
MW547-1	6/30/1994	ND<2.8 U	9 - 40	38	-34
MW410-3	7/13/1994	ND<2.8 U	9 - 41	38	-34
MW547-1	6/30/1994	ND<2.8 U	9 - 42	38	-34
MW547-2	6/30/1994	ND<2.8 U	9 - 43	38	-34
MW410-4	7/13/1994	ND<2.8 U	9 - 44	38	-34
MW410-1	7/2/1994	2.8	10 - 44	65	20
MW410-3	7/13/1994	2.9	11 - 44	66	22
MW410-4	7/13/1994	ND<2.9 U	11 - 45	39	-32

Gehan Ranks

Point	Date	Result	d - e	Rank	a(R)
MW410-3	7/13/1994	ND<2.9 U	11 - 46	39	-32
MW547-2	6/30/1994	2.9	12 - 46	68	26
MW410-3	7/13/1994	ND<2.9 U	12 - 47	39.5	-31
B410-7	7/13/1994	ND<3 U	12 - 48	39.5	-31
MW410-4	7/13/1994	ND<3 U	12 - 49	39.5	-31
B410-9	7/13/1994	ND<3 U	12 - 50	39.5	-31
MW547-1	6/30/1994	3	13 - 50	71	32
B410-9	7/13/1994	ND<3.1 U	13 - 51	40	-30
MW410-1	7/2/1994	3.1	14 - 51	72.5	35
MBG-3	5/30/1996	3.14	15 - 51	73.5	37
MW547-2	6/30/1994	3.2	16 - 51	74.5	39
B410-7	7/13/1994	3.2	17 - 51	75.5	41
B410-7	7/13/1994	3.3	18 - 51	76.5	43
033-IWTP360-015	1/1/2000	3.4	19 - 51	77.5	45
MW547-1	6/30/1994	3.5	20 - 51	78.5	47
MW410-1	7/2/1994	3.5	21 - 51	79.5	49
B410-9	7/13/1994	3.5	22 - 51	80.5	51
MW410-3	7/13/1994	3.7	23 - 51	81.5	53
033-IWTP360-018	1/1/2000	3.8	24 - 51	82.5	55
MW410-4	7/13/1994	4	25 - 51	83.5	57
033-IWTP360-022	1/1/2000	4	26 - 51	84.5	59
033-IWTP360-027	1/1/2000	4.5	27 - 51	85.5	61
033-IWTP360-028	1/1/2000	4.9	28 - 51	86.5	63
B410-7	7/13/1994	5	29 - 51	87.5	65
MW547-2	6/30/1994	5.3	30 - 51	88.5	67
B410-9	7/13/1994	5.9	31 - 51	89.5	69
B410-9	7/13/1994	6	32 - 51	90.5	71
B410-7	7/13/1994	6.1	33 - 51	91.5	73
MW410-1	7/2/1994	6.2	34 - 51	92.5	75
033-IWTP360-025	1/1/2000	7.7	35 - 51	93.5	77
B547-6	7/3/1994	ND<10 U	35 - 52	51	-8
MWC2-3	7/26/1994	ND<11 U	35 - 53	51	-8
B547-10	7/3/1994	ND<11 U	35 - 54	51	-8
BC2-7	7/25/1994	ND<12 U	35 - 55	51	-8
B547-10	7/3/1994	12	36 - 55	96.5	83
MWC2-3	7/26/1994	ND<12 U	36 - 56	51.5	-7
MWC2-3	7/26/1994	ND<12 U	36 - 57	51.5	-7
B547-6	7/3/1994	ND<12 U	36 - 58	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 59	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 60	51.5	-7
B547-10	7/3/1994	ND<12 U	36 - 61	51.5	-7
B547-6	7/3/1994	ND<12 U	36 - 62	51.5	-7
MWC2-3	7/26/1994	ND<12 U	36 - 63	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 64	51.5	-7
MWC2-3	7/26/1994	ND<13 U	36 - 65	51.5	-7
MWC2-3	7/26/1994	ND<13 U	36 - 66	51.5	-7
B547-6	7/3/1994	15	37 - 66	103	96
033-IWTP360-002	1/1/2000	15.5	38 - 66	104	98
B547-6	7/3/1994	16	39 - 66	105	100
B547-6	7/3/1994	17	40 - 66	106	102
B547-10	7/3/1994	18	41 - 66	107	104
B547-10	7/3/1994	21	42 - 66	108	106
B547-10	7/3/1994	23	43 - 66	109	108

Gehan Numerator = 8, Gehan Denominator Sum = 226908, Gehan Denominator = 185.229, Gehan Statistic = 0.0431897
Z = 1.64485 at 95% level of significance
0.0431897 < 1.64485
No Statistical Significance at 95% Confidence Level

DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
1455 FRAZEE RD, SUITE 900
SAN DIEGO, CA 92108-4310

5090
Ser BPMOW.LO\0778
September 12, 2006

Mr. Salvatore Ciriello
Section Chief
Standardized Permits and Corrective Action Branch
Department of Toxic Substances Control
700 Heinz Avenue, Suite 200
Berkeley, CA 94710-2721

Dear Mr Ciriello:

Subj: RESPONSE TO COMMENTS IWTP 360, HAZARDOUS WASTE FACILITY PERMIT EPA ID CA2170023236 NAVAL AIR STATION ALAMEDA NOW KNOWN AS ALAMEDA POINT, ALAMEDA, CALIFORNIA

Enclosed is Navy's Response to Comments (RTCs) from Department of Toxic Substances Control (DTSC) on the Draft Closure Report Industrial Waste Treatment Plant (IWTP) 360. Your forwarding letter of May 26, 2006 requests that a revised closure report be submitted to DTSC by June 30, 2006. As stated in the email of June 22, 2006, we were unable to meet this date due to the additional risk assessments needed to comply with DTSC's Human and Ecological Risk Division (HERD) review comments, and the project scope issue with the Navy contractor.

Now the project is ready to proceed again, discuss the RTCs or meet with DTSC. Upon resolution of comments, we need forty five (45) calendar days to submit the revised closure report. We would appreciate your response by September 30, 2006. Should you have any questions, please contact Mr. Lou Ocampo, Navy Remedial Project Manager at (619) 532-0969 or me at (619) 532-0907.

Sincerely,

THOMAS L. MACCHIARELLA
BRAC Environmental Coordinator
By direction of the Director

Encl: (1) RTCs IWTP 360 Sep 11, 2006

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September 12, 2006

Copy to:

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RESPONSE TO DTSC REVIEW COMMENTS ON DRAFT AMENDMENT TO CLOSURE SUMMARY REPORT INDUSTRIAL WASTE TREATMENT PLANT 360, ALAMEDA POINT, ALMEDA, CALIFORNIA
September 11, 2006

Review Comments dated May 24, 2006 from Buck King, PG, CEG, Engineering Geologist, Geological Services Unit, Hazardous Waste Management Program, Berkeley Regional Office.

GSU Recommendation 1:

The GSU recommends that the soil characterization data presented in the Closure Summary Report be reorganized to present conditions in the 0 to 2 foot depth range, and the 0 to 10 foot depth range, in order to support risk assessment evaluation. The revised evaluation should include a statistical comparison of site soil data to background soil data. Instances where statistical comparison can not be made due to insufficient data or censored data should be noted.

RESPONSE TO RECOMMENDATION 1:

As recommended by Human and Ecological Risk Division (HERD)' specific comment 4 on soil characterization data, the maximum values and 95% UCL values (as applicable) for the existing site soil data will be recalculated using the recommended depth intervals of 0-1 feet and 0-10 feet.

GSU Recommendation 2:

The GSU recommends that groundwater data used to characterize the site include the results from well M04-05. The well M04-05 is approximately 30 feet down gradient of the vitrified clay pipe lines associated with IWTP 360, and is considered representative of groundwater conditions associated with the regulated unit. The revised report should include a revised statistical evaluation of site groundwater data compared to background groundwater data.

RESPONSE TO RECOMMENDATION 2:

The groundwater data from well M04-05 should not be included in the characterization of the IWTP site because M04-05 is included in an ongoing base wide groundwater investigation under the CERCLA program, which also covers the groundwater beneath IWTP 360. For this same reason, the well was not included in the Final Amendment on the Closure Plan and Sampling and Analysis Plan, which were both approved by DTSC.

Review Comments dated May 18, 2006 from Riz A. Sarmiento, Ph.D., Staff Toxicologist, Human and Ecological Risk Division (HERD)
September 11, 2006

HERD General Comment:

The Human Health Risk Assessment (HHRA) prepared by Tetra Tech EM Inc. in September 2004 has deficiencies that are reflected in the Technical Addendum to the Human Health Risk Assessment (ITSI, 2006). HERD recommends that the risk assessment (Tetra Tech EM Inc., 2004) be revised by incorporating the following comments from HERD so that the Technical Addendum can be revised accordingly. It is also HERD's understanding that the request to close IWTP 360 is based on the soil meeting the RCRA requirements by the groundwater will be addressed under the Comprehensive Environmental Compensation Liability Act (CERCLA). If so, this seems to be a modification of RCRA Closure requirements. Please indicate whether or not HERD's understanding of the approach is accurate.

RESPONSE TO GENERAL COMMENT:

The deficiencies identified in the Human Health Risk Assessment (TtEMI, 2004) will be addressed and presented in a revised Technical Addendum to the HHRA. In addition, HERD's understanding regarding the Navy's request that groundwater at the site be addressed under CERCLA is correct. Since groundwater flows and commingles beyond IWTP 360, it is likely cost prohibitive to implement any RCRA corrective action on the groundwater while a more comprehensive basewide groundwater investigation is ongoing under the CERCLA program. Under Section 8 – Statutory Compliance/RCRA–CERCLA Integration, Federal Facility Agreement at Alameda Point between the Navy and regulatory agencies, it is stated that the Parties intend to integrate the Navy's CERCLA response obligations with RCRA corrective action obligations. Summarizing another statement in the section, the Parties intend that activities covered by this agreement will achieve compliance with CERCLA, satisfy correction action requirements of RCRA sections for a RCRA permit, for interim status facilities, and meet or exceed all applicable or relevant and appropriate Federal and State laws and regulations.

HERD Specific Comment 1: Table 1, Step 2: Identify the Decisions

This step should discuss the action and alternative action, e.g. no further action, further investigations, remediation, once the stated problem is addressed. The decision that is stated in this document seems to be more appropriate as the stated problem, i.e., it is unknown (a) if the target constituents in subsurface soils are present at concentrations that exceed the preliminary remediation goals (PRGs), (b) if the constituents in groundwater in the vicinity of IWT360 are present at concentrations that exceed the maximum contaminant levels (MCLs). Step 2 should identify the action if it is demonstrated that the subsurface soil constituents exceed the PRGs or if the chemical concentrations in groundwater exceed MCLs.

RESPONSE TO SPECIFIC COMMENT 1:

The intent of including the DQO table in the closure report was to reiterate the goals developed in the Sampling Plan for the Closure Confirmation Sampling (TtEMI, 2004). Although the table will not be revised, the Navy would like to clarify the proposed actions based on the findings of the confirmation sampling and risk assessment as follows: If it is determined that a corrective action on the soil is needed, RCRA corrective action will be conducted; if a corrective action is needed on the groundwater, it will be deferred to the CERCLA program, as previously stated.

HERD Specific Comment 2, Identification of Chemicals of Potential Concern (COPC), page 36:

HERD does not agree with the elimination of iron as a COPC because on-site activities were not considered to contribute iron to the environment. If iron was detected, and the highest concentration was not at or below the background level, then iron should be evaluated as a COPC.

HERD does not recommend the elimination of a chemical as a COPC based solely on a comparison to its corresponding preliminary remediation goal (PRG) value. The cumulative screening risk and/or hazard index should be presented, and the rationale for eliminating a specific chemical as a COPC should be discussed and agreed upon by DTSC.

RESPONSE TO SPECIFIC COMMENT 2:

Iron will no longer be eliminated based on the fact that site activities did not involve its use. Cited sections will be revised accordingly. As requested in specific comment 5, a new background evaluation will be completed for metals results, including iron, from the samples collected at the site. Those metals determined to be statistically greater than background will be considered a COPC, and will be included in the total risk calculations.

HERD Specific Comment 3, Section 8.2.1, 2nd paragraph, page 37:

The statement "EPA risk assessment guidance (1989) includes a preference for evaluation of the residential pathway" is inaccurate. Although the Risk Assessment Guidance for Superfund (EPA, 1989) states that residential land use is "generally the most conservative choice to make when deciding what type of alternate land use may occur in the future," the Guidance does state that future residential use may not be justified if it is unlikely that the site will support residential use. HERD recommends that this statement be restated that the evaluation of the residential scenario is intended to provide flexibility in the reuse plan rather than for compliance with EPA risk assessment guidance.

RESPONSE TO SPECIFIC COMMENT 3:
The statement will be revised as recommended.

HERD Specific Comment 4, Section 8.2.2, Estimation of Exposure Point Concentrations, page 38:

The human health risk assessment used soil data from 0 to 4 feet below ground surface (bgs) because soil data from 0 to 2 feet bgs is minimal. The potential exposures of a human receptor are delineated into surface soil and subsurface soil exposures. Surface soil is typically from surface to one-foot bgs, and subsurface soil extends to a depth of 10 feet bgs. If, as the report indicates, the surface soil data are minimal and do not justify the calculation of a 95% upper confidence limit (UCL), then HERD recommends that the maximum concentration detected between 0 to 1 foot bgs be used be to evaluate surface soil exposures.

RESPONSE TO SPECIFIC COMMENT 4:

The maximum values and 95% UCL values (as applicable) for the existing site soil data will be recalculated using the recommended depth intervals of 0-1 feet and 0-10 feet.

HERD Specific Comment 5, Section 8.4, page 41:

Please clarify that the total risk and hazard index estimates posed to an adult and child are calculated under the residential scenario only.

The incremental risk excludes, rather than includes, background metals. Based on recent internal discussions, HERD recommends a revised methodology for addressing background or ambient concentrations. If a detected chemical's maximum concentration is higher than its corresponding background or ambient level, then the chemical is not identified as a COPC. However, the background concentration is compared to its corresponding PRG in order to estimate its screening risk and hazard index. The background risk and/or hazard index are presented in the risk characterization along with the risk and/or hazard index due to the detected site concentrations in order to provide a perspective on the results of the risk assessment.

This report states that Section 8.4.2 presents the incremental risk for the residential scenario, and that Section 8.4.4 presents the health effects associated with lead exposure. Please correct the cited sections to Section 8.4.2.3 and 8.4.2, respectively.

RESPONSE TO SPECIFIC COMMENT 5:

Total risk and hazard index estimates are calculated for both adult and child under the residential exposure scenario only. The remaining exposure scenarios; future commercial/industrial worker, and future construction worker, include the calculation of total risk and hazard index estimates for adult exposures only.

COPCs will be re-evaluated/re-identified by comparing the site soil data to the Alameda Basewide Background data (see attachment for the proposed methodology for evaluating site data versus background data). Chemicals present at the site at concentrations consistent with background will not be included in the COPC list, but the concentrations will be compared to the PRGs; those site background concentrations that are above PRGs will be further evaluated and presented with the background risk. Cited sections will be revised accordingly.

HERD Specific Comment 6, Summary of Calculated Non-Carcinogenic Hazards, page 42:

Please clarify the following footnotes in this summary:

- Footnote (2) states that the incremental HI is mostly from potential exposure to metals in groundwater, but the HI due to groundwater exposure is not presented. Please present the HI due to groundwater.
- Footnote (2) also states that removing arsenic and manganese background levels results in an HI of 5.32 due to surface soils at the site. HERD notes that the incremental hazard index (HI) for residential surface soils is shown to be 10.1 (i.e., total HI of 18.2 less the background HI of 8.1). Therefore, the risk due to background levels was already taken into account in order to calculate the incremental HI. Hence, it is not appropriate to subtract, once again, the HI due to background levels of arsenic and manganese in order to reduce the HI to 5.32.

Rather than just stating that the incremental risk is from groundwater only, or that removing groundwater would result in reduced risk estimates, HERD recommends that the summary table presented in Section C3.0 of Appendix C be shown in Section 8.4.1 in order to provide a more comprehensive presentation of the risk and hazard index estimates. Without these values, the current summary tables do not clearly support the conclusions that groundwater is the primary contributor.

HERD recommends that the summary table be revised according to Specific Comment 5.

RESPONSE TO SPECIFIC COMMENT 6:

The summary table presented in Section C3.0 will be revised based on the new COPCs generated in response to Specific Comment 5. In addition, this revised summary table will be presented in Section 8.4.1. Cited footnotes will be clarified.

HERD Specific Comment 7, Section 8.4.1.2, Construction Worker Scenario, page 43:

The human health risk assessment did not evaluate the groundwater pathway. If the depth to groundwater ranges from 4.5 to 12 feet bgs, there is the possibility that a construction worker associated with redevelopment activities could come into contact with the shallow groundwater. HERD recommends that the risk assessment include an evaluation of potential exposure of construction worker to groundwater via incidental ingestion and dermal contact. The used of personal protective equipments (PPE) or other mitigating measures during construction activities can be discussed subsequently if the baseline risk estimates should indicate that the levels are unacceptable.

RESPONSE TO SPECIFIC COMMENT 7:

A pathway for construction worker for incidental ingestion of and dermal exposure to groundwater will be added and evaluated, though the Navy believes that incidental ingestion of groundwater by construction work is not a very realistic assumption.

HERD Specific Comment 8, Appendix C, Section C2.0:

Contrary to the last statement in Section C2.0, Table 2 in Appendix C presents the dermal absorption factors but does not present the exposure factors and toxicity values. Please revise either the statement in Section 2.0 or Table 2 for consistency.

RESPONSE TO SPECIFIC COMMENT 8:

The reference in the text should be to Table 1 not 2. The text will be revised.

HERD Specific Comment 9, Appendix C, Table 1:

Based on the conversion of the Reference Exposure Limit (REL) to a Reference Dose (RfD), the RfD for hexavalent chromium should be 5.7E-5 instead of 3E-3. Please correct the presented value. Furthermore, the values presented as inhalation reference concentrations are inhalation reference dose values. Please revise for accuracy.

RESPONSE TO SPECIFIC COMMENT 9:

The cited hexavalent chromium was a typo and will be corrected in the text; note that the correct value of 5.7E-5 was used in the calculations for hexavalent chromium. The cited references will be corrected on the table.

HERD Specific Comment 10, Appendix C, Table 3 and Table 6 in main body of the report:

Analytes with 95% UCL background concentrations higher than the 95% UCL site concentrations were identified as COPCs based on the frequency of detection. HERD does not agree with this approach. If an analyte has a site concentration that is at or lower than the corresponding concentration, then that analyte should not be identified as a COPC. The next step would be to compare the site concentrations to the USEPA Region IX and CalEPA-modified residential soil PRG in order to calculate a background risk or hazard index.

Based on this recommendation, aluminum, arsenic, cobalt, manganese, nickel, and vanadium should be eliminated from the list of soil COPCs.

RESPONSE TO SPECIFIC COMMENT 10:

In Specific Comment 5, HERD recommends a revised methodology for addressing background concentrations; thus, specific COPCs are being re-evaluated/re-identified based on the recalculated site soil data. In addition, each analyte will be identified or eliminated as a COPC in accordance with the above recommendations.

HERD Specific Comment 11, Appendix C, Risk and Hazard Calculations:

HERD spot-checked the risk and hazard calculations and has the following comments:

- The toxicity values were labeled as cancer slope factors (CSF)/Unit Risk. The risk associated with the inhalation pathway is either the product of the air concentrations (expressed in mg/m^3 or ug/m3) multiplied by the unit risk, or the product of the calculated dose multiplied by the inhalation slope factor. It is apparent that the risk estimates due to inhalation was conducted by multiplying the dose or intake with the inhalation slope factor, and the slope factors were used to estimate the risks due to the ingestion and dermal pathways. Therefore, HERD recommends that the term "unit risk" be deleted from the headings in the Table 7 series tables in order to avoid confusion.

  Similarly, the term reference concentration (RfC) should be deleted from the tables since it seems that the reference dose (RfD) was used to estimate the hazard due to the inhalation, ingestion, and dermal pathways.

- HERD's calculation risk estimates due to arsenic in soil at 0 – 4 feet are within the range of the presented risk estimates, but the risk estimates due to the inhalation and dermal pathways differ by at least an order of magnitude. HERD could not duplicate the inhalation and dermal risk estimates associated with the beryllium and cadmium in soil as well as the hazard quotients due to the ingestion pathway. HERD notes that the ingestion pathway is the primary contributor to the cumulative hazard index.

- The sources of the toxicity values that were updated should be identified in the footnotes of the tables.

RESPONSE TO SPECIFIC COMMENT 11:

- The references to "unit risk" and "reference concentration (RfC)" in the heading of the Table 7 series of tables will be deleted as recommended.

- The inhalation and dermal risk estimates for soil will be rechecked/recalculated and the tables updated as appropriate.

- The source of toxicity values will be included in the footnotes of the tables.

HERD Specific Comment 12, Figure C-6:

Based on Specific Comment 7, please indicate in the Conceptual Site Model that potential exposure of a construction worker to groundwater are potentially complete.

RESPONSE TO SPECIFIC COMMENT 12:

The Conceptual Site Model will be updated as recommended and included as a part of the Technical Addendum to the HHRA.

HERD Specific Comment 13, Tabulated Presentation of Risk and Hazard Index Estimates:

HERD recommends that the summary tables on page 42 and on pages C-2 and C-3 be revised for clarity, consistency, and accuracy. The Table 7 series shows the risk and hazard index calculations for the adult and child resident, the commercial/industrial worker, and the construction worker. The results presented in these tables are subsequently summarized in the Table 9 series. However, the values presented in the summary tables are inconsistent with the values presented in the calculation tables. In some cases, the discrepancies are due to the rounding off of figures but other seem to be due to insufficient internal review. The summary table on page 42 reflects the inconsistencies in the summary tables in Appendix C.

As an example, the total risk due to surface soil exposures of a child resident is shown to be 4.3E-05 (Appendix C, Table 9.1) but the summary table in Section C3.0 shows a total risk of 3E-05. The hazard index due to surface exposures of a child resident is shown to be 1.0 or 1.22 in Table 9.1 and 1.5 in the summary table of C3.0.

HERD recommends that the presented values be presented in a consistently manner throughout the document. If the values are to be rounded off to a certain number of significant figures, then this should be done throughout instead of showing values for the same scenario as 1 or 1.11 or 1.5. Additional revisions to the summary tables in Section C3.0 include the following:

- The primary contributors to the total risk due to residential exposures to surface soils are arsenic and cadmium instead of arsenic only.
- Vanadium is not a primary contributor to the hazard index due to groundwater exposures, and should be deleted from the list.

RESPONSE TO SPECIFIC COMMENT 13:

The series 7 Tables were updated using current DTSC values, however, no updates were done for the table 9 series. Thus, the governing risk tables are those updated tables provided as part of the Technical Addendum. The Table 9 series included as part of the TtEMI Risk Assessment are no longer directly applicable, and are included only because they are part of the referenced original document.

ATTACHMENT FOR
Response to HERD Specific Comment 5

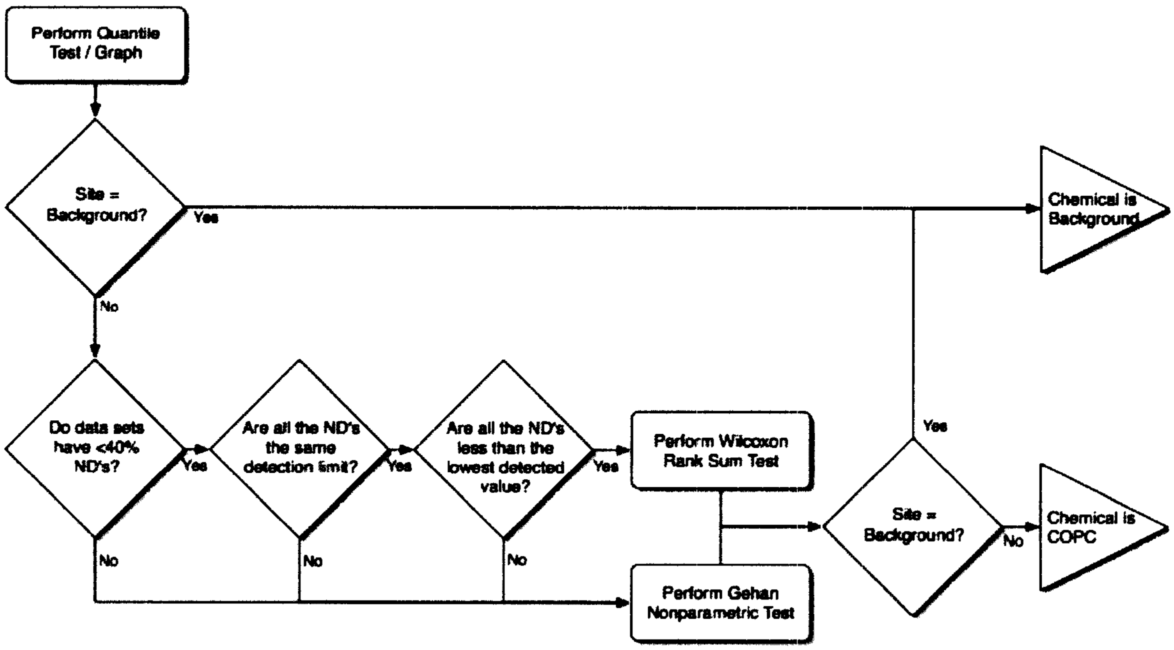
Procedure for Evaluating Site Chemical Data Against Background Data
IWTP360, Alameda Point, California

The site is located within the background area designated as "blue". The electronic data results were obtained from TtEMI that correspond to the samples used to develop the blue background data set, as identified in *Summary of Background Concentrations in Soil and Groundwater, Alameda Point*, by Tetra Tech EM Inc., dated December 2001.

As the constituents of interest are metals, and many of the metals include numerous non-detect values, comparison with background will center on a combination of graphical evaluations and nonparametric tests. A flow diagram of the proposed process is provided below:

An example analysis using the above process was performed for arsenic in soil, of particular interest at IWTP360.

Evaluating Site Data Against Background Data to Determine COPC

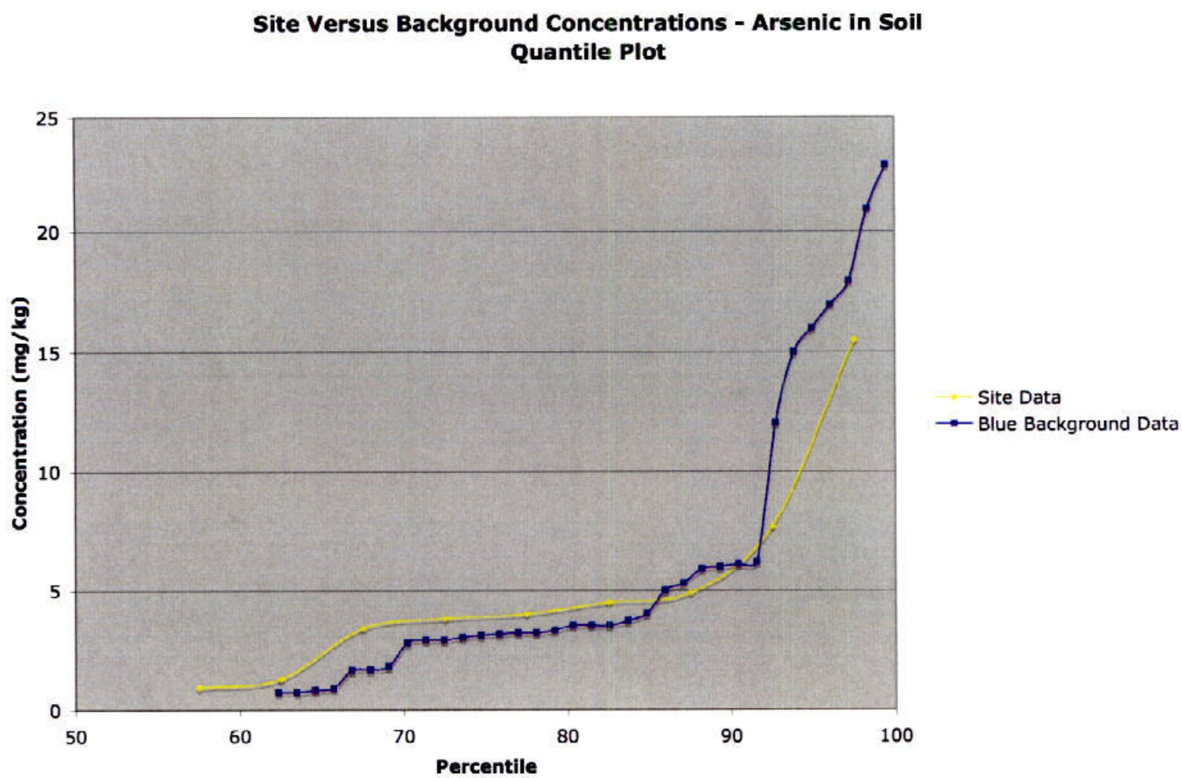


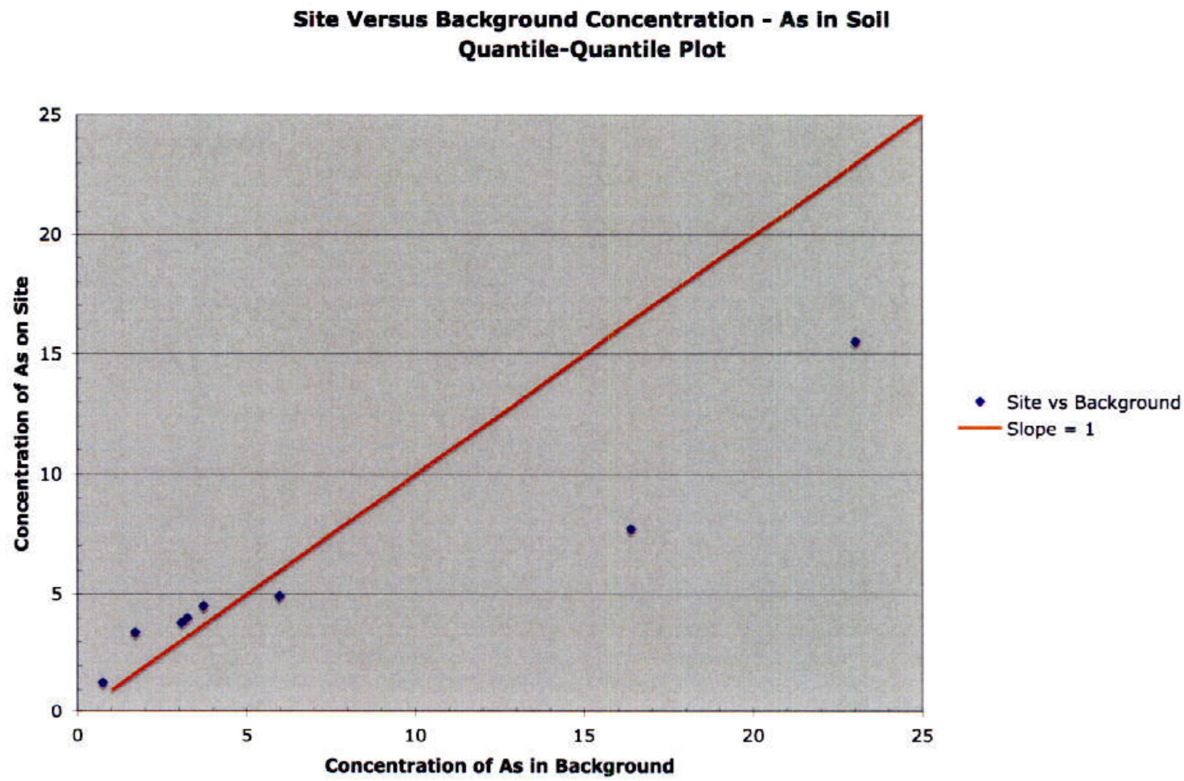
Basic Summary Statistics

Sample Set	No. Samples	No. NDs	% ND	Average (Detect Results)	Maximum
Blue Background	89	55	61.8%	6.19	23
Site Data	20	11	55.0%	5.12	15.5

Quantile Test / Graph

Several graphical methods were used to evaluate site versus background to determine the most efficient and effective method. Two approaches performed using excel on the raw data included a quantile plot and quantile-quantile plot comparing the blue background data to the site data, as shown below:





The results show quite clearly the site data falls well below background data in the higher concentration range. A quantile test was also performed on the data using ChemStat 6.1 (a software package designed specifically for evaluating chemical data for RCRA compliance). Results of this analysis indicated "*no statistical significance at 95% confidence level*".

Gehan Nonparametric Test

Due to the high percentage of NDs in the data set for arsenic in soil (greater than 50% for both background and site data sets), a Gehan Test was performed (again using ChemStat 6.1). The Gehan Statistic was 0.043, well below the criteria of 1.645, resulting in "*no statistical significance at 95% confidence level*". A copy of the output is provided below.

To validate these findings, given the high values found in the background data set, an outlier analysis was performed on the background data. Two potential outliers were identified. The site data passed the Gehan Test even after removing the potential outliers from the background data.

Gehan Non-Parametric Rank Test
Parameter: ARSENIC

Gehan Ranks

Point	Date	Result	d - e	Rank	a(R)
033-IWTP360-024	1/1/2000	ND<0.35	0 - 1	33.5	-43
B16-11	8/20/1998	ND<0.61 U	0 - 2	33.5	-43
B16-10	8/20/1998	ND<0.66 U	0 - 3	33.5	-43
B16-11	8/20/1998	ND<0.7 U	0 - 4	33.5	-43
M09-05	11/6/1998	ND<0.71 U	0 - 5	33.5	-43
B16-10	8/20/1998	ND<0.72 U	0 - 6	33.5	-43
M16-04	11/8/1998	0.74 J	1 - 6	37	-36
M16-04	11/8/1998	0.74 J	2 - 6	38	-34
B16-11	8/20/1998	ND<0.79 U	2 - 7	34.5	-41
B16-10	8/20/1998	ND<0.8 U	2 - 8	34.5	-41
M09-05	11/6/1998	0.84 J	3 - 8	40	-30
B16-12	8/20/1998	ND<0.88 U	3 - 9	35	-40
134-0014	1/1/2000	ND<0.88	3 - 10	35	-40
M09-05	11/6/1998	0.92 J	4 - 10	42	-26
134-0014M	1/1/2000	0.94	5 - 10	43	-24
033-IWTP360-019	1/1/2000	ND<1	5 - 11	36	-38
B16-12	8/20/1998	ND<1.2 U	5 - 12	36	-38
033-IWTP360-004	1/1/2000	ND<1.2	5 - 13	36	-38
134-0015M	1/1/2000	1.3	6 - 13	45.5	-19
B16-10	8/20/1998	ND<1.3 U	6 - 14	36.5	-37
033-IWTP360-003	1/1/2000	ND<1.4	6 - 15	36.5	-37
B16-12	8/20/1998	ND<1.4 U	6 - 16	36.5	-37
033-IWTP360-013	1/1/2000	ND<1.4	6 - 17	36.5	-37
B07C-11	8/18/1998	ND<1.5 U	6 - 18	36.5	-37
033-IWTP360-035	1/1/2000	ND<1.5	6 - 19	36.5	-37
MBG-3	5/30/1996	1.63	7 - 19	49.5	-11
MBG-3	5/30/1996	1.68	8 - 19	50.5	-9
033-IWTP360-001	1/1/2000	ND<1.7	8 - 20	37.5	-35
MBG-3	5/30/1996	1.8	9 - 20	52	-6
B07C-11	8/18/1998	ND<1.9 U	9 - 21	38	-34
B07C-11	8/18/1998	ND<1.9 U	9 - 22	38	-34
033-IWTP360-012	1/1/2000	ND<1.9	9 - 23	38	-34
MW410-1	7/2/1994	ND<1.9 U	9 - 24	38	-34
033-IWTP360-034	1/1/2000	ND<2	9 - 25	38	-34
B07C-12	8/18/1998	ND<2 U	9 - 26	38	-34
MW410-1	7/2/1994	ND<2.2 U	9 - 27	38	-34
033-IWTP360-021	1/1/2000	ND<2.3	9 - 28	38	-34
MW410-4	7/13/1994	ND<2.4 U	9 - 29	38	-34
MW410-1	7/2/1994	ND<2.4 U	9 - 30	38	-34
B410-9	7/13/1994	ND<2.4 U	9 - 31	38	-34
MW547-1	6/30/1994	ND<2.5 U	9 - 32	38	-34
MW410-4	7/13/1994	ND<2.5 U	9 - 33	38	-34
MW547-2	6/30/1994	ND<2.5 U	9 - 34	38	-34
MW547-1	6/30/1994	ND<2.5 U	9 - 35	38	-34
MW410-3	7/13/1994	ND<2.6 U	9 - 36	38	-34
B410-7	7/13/1994	ND<2.6 U	9 - 37	38	-34
MW547-2	6/30/1994	ND<2.7 U	9 - 38	38	-34
MW547-2	6/30/1994	ND<2.7 U	9 - 39	38	-34
MW547-1	6/30/1994	ND<2.8 U	9 - 40	38	-34
MW410-3	7/13/1994	ND<2.8 U	9 - 41	38	-34
MW547-1	6/30/1994	ND<2.8 U	9 - 42	38	-34
MW547-2	6/30/1994	ND<2.8 U	9 - 43	38	-34
MW410-4	7/13/1994	ND<2.8 U	9 - 44	38	-34
MW410-1	7/2/1994	2.8	10 - 44	65	20
MW410-3	7/13/1994	2.9	11 - 44	66	22
MW410-4	7/13/1994	ND<2.9 U	11 - 45	39	-32

Gehan Ranks

Point	Date	Result	d - e	Rank	a(R)
MW410-3	7/13/1994	ND<2.9 U	11 - 46	39	-32
MW547-2	6/30/1994	2.9	12 - 46	68	26
MW410-3	7/13/1994	ND<2.9 U	12 - 47	39.5	-31
B410-7	7/13/1994	ND<3 U	12 - 48	39.5	-31
MW410-4	7/13/1994	ND<3 U	12 - 49	39.5	-31
B410-9	7/13/1994	ND<3 U	12 - 50	39.5	-31
MW547-1	6/30/1994	3	13 - 50	71	32
B410-9	7/13/1994	ND<3.1 U	13 - 51	40	-30
MW410-1	7/2/1994	3.1	14 - 51	72.5	35
MBG-3	5/30/1996	3.14	15 - 51	73.5	37
MW547-2	6/30/1994	3.2	16 - 51	74.5	39
B410-7	7/13/1994	3.2	17 - 51	75.5	41
B410-7	7/13/1994	3.3	18 - 51	76.5	43
033-IWTP360-015	1/1/2000	3.4	19 - 51	77.5	45
MW547-1	6/30/1994	3.5	20 - 51	78.5	47
MW410-1	7/2/1994	3.5	21 - 51	79.5	49
B410-9	7/13/1994	3.5	22 - 51	80.5	51
MW410-3	7/13/1994	3.7	23 - 51	81.5	53
033-IWTP360-018	1/1/2000	3.8	24 - 51	82.5	55
MW410-4	7/13/1994	4	25 - 51	83.5	57
033-IWTP360-022	1/1/2000	4	26 - 51	84.5	59
033-IWTP360-027	1/1/2000	4.5	27 - 51	85.5	61
033-IWTP360-028	1/1/2000	4.9	28 - 51	86.5	63
B410-7	7/13/1994	5	29 - 51	87.5	65
MW547-2	6/30/1994	5.3	30 - 51	88.5	67
B410-9	7/13/1994	5.9	31 - 51	89.5	69
B410-9	7/13/1994	6	32 - 51	90.5	71
B410-7	7/13/1994	6.1	33 - 51	91.5	73
MW410-1	7/2/1994	6.2	34 - 51	92.5	75
033-IWTP360-025	1/1/2000	7.7	35 - 51	93.5	77
B547-6	7/3/1994	ND<10 U	35 - 52	51	-8
MWC2-3	7/26/1994	ND<11 U	35 - 53	51	-8
B547-10	7/3/1994	ND<11 U	35 - 54	51	-8
BC2-7	7/25/1994	ND<12 U	35 - 55	51	-8
B547-10	7/3/1994	12	36 - 55	96.5	83
MWC2-3	7/26/1994	ND<12 U	36 - 56	51.5	-7
MWC2-3	7/26/1994	ND<12 U	36 - 57	51.5	-7
B547-6	7/3/1994	ND<12 U	36 - 58	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 59	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 60	51.5	-7
B547-10	7/3/1994	ND<12 U	36 - 61	51.5	-7
B547-6	7/3/1994	ND<12 U	36 - 62	51.5	-7
MWC2-3	7/26/1994	ND<12 U	36 - 63	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 64	51.5	-7
MWC2-3	7/26/1994	ND<13 U	36 - 65	51.5	-7
MWC2-3	7/26/1994	ND<13 U	36 - 66	51.5	-7
B547-6	7/3/1994	15	37 - 66	103	96
033-IWTP360-002	1/1/2000	15.5	38 - 66	104	98
B547-6	7/3/1994	16	39 - 66	105	100
B547-6	7/3/1994	17	40 - 66	106	102
B547-10	7/3/1994	18	41 - 66	107	104
B547-10	7/3/1994	21	42 - 66	108	106
B547-10	7/3/1994	23	43 - 66	109	108

Gehan Numerator = 8, Gehan Denominator Sum = 226908, Gehan Denominator = 185.229, Gehan Statistic = 0.0431897
Z = 1.64485 at 95% level of significance
0.0431897 < 1.64485
No Statistical Significance at 95% Confidence Level

DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
1455 FRAZEE RD, SUITE 900
SAN DIEGO, CA 92108-4310

5090
Ser BPMOW.LO\0778
September 12, 2006

Mr. Salvatore Ciriello
Section Chief
Standardized Permits and Corrective Action Branch
Department of Toxic Substances Control
700 Heinz Avenue, Suite 200
Berkeley, CA 94710-2721

Dear Mr Ciriello:

Subj: RESPONSE TO COMMENTS IWTP 360, HAZARDOUS WASTE FACILITY PERMIT EPA ID CA2170023236 NAVAL AIR STATION ALAMEDA NOW KNOWN AS ALAMEDA POINT, ALAMEDA, CALIFORNIA

Enclosed is Navy's Response to Comments (RTCs) from Department of Toxic Substances Control (DTSC) on the Draft Closure Report Industrial Waste Treatment Plant (IWTP) 360. Your forwarding letter of May 26, 2006 requests that a revised closure report be submitted to DTSC by June 30, 2006. As stated in the email of June 22, 2006, we were unable to meet this date due to the additional risk assessments needed to comply with DTSC's Human and Ecological Risk Division (HERD) review comments, and the project scope issue with the Navy contractor.

Now the project is ready to proceed again, discuss the RTCs or meet with DTSC. Upon resolution of comments, we need forty five (45) calendar days to submit the revised closure report. We would appreciate your response by September 30, 2006. Should you have any questions, please contact Mr. Lou Ocampo, Navy Remedial Project Manager at (619) 532-0969 or me at (619) 532-0907.

Sincerely,

THOMAS L. MACCHIARELLA
BRAC Environmental Coordinator
By direction of the Director

Encl: (1) RTCs IWTP 360 Sep 11, 2006

5090
Ser BPMOW.LO\0778
September 12, 2006

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RESPONSE TO DTSC REVIEW COMMENTS ON DRAFT AMENDMENT TO CLOSURE SUMMARY REPORT INDUSTRIAL WASTE TREATMENT PLANT 360, ALAMEDA POINT, ALMEDA, CALIFORNIA
September 11, 2006

Review Comments dated May 24, 2006 from Buck King, PG, CEG, Engineering Geologist, Geological Services Unit, Hazardous Waste Management Program, Berkeley Regional Office.

GSU Recommendation 1:

The GSU recommends that the soil characterization data presented in the Closure Summary Report be reorganized to present conditions in the 0 to 2 foot depth range, and the 0 to 10 foot depth range, in order to support risk assessment evaluation. The revised evaluation should include a statistical comparison of site soil data to background soil data. Instances where statistical comparison can not be made due to insufficient data or censored data should be noted.

RESPONSE TO RECOMMENDATION 1:

As recommended by Human and Ecological Risk Division (HERD)' specific comment 4 on soil characterization data, the maximum values and 95% UCL values (as applicable) for the existing site soil data will be recalculated using the recommended depth intervals of 0-1 feet and 0-10 feet.

GSU Recommendation 2:

The GSU recommends that groundwater data used to characterize the site include the results from well M04-05. The well M04-05 is approximately 30 feet down gradient of the vitrified clay pipe lines associated with IWTP 360, and is considered representative of groundwater conditions associated with the regulated unit. The revised report should include a revised statistical evaluation of site groundwater data compared to background groundwater data.

RESPONSE TO RECOMMENDATION 2:

The groundwater data from well M04-05 should not be included in the characterization of the IWTP site because M04-05 is included in an ongoing base wide groundwater investigation under the CERCLA program, which also covers the groundwater beneath IWTP 360. For this same reason, the well was not included in the Final Amendment on the Closure Plan and Sampling and Analysis Plan, which were both approved by DTSC.

Review Comments dated May 18, 2006 from Riz A. Sarmiento, Ph.D., Staff Toxicologist, Human and Ecological Risk Division (HERD)
September 11, 2006

HERD General Comment:

The Human Health Risk Assessment (HHRA) prepared by Tetra Tech EM Inc. in September 2004 has deficiencies that are reflected in the Technical Addendum to the Human Health Risk Assessment (ITSI, 2006). HERD recommends that the risk assessment (Tetra Tech EM Inc., 2004) be revised by incorporating the following comments from HERD so that the Technical Addendum can be revised accordingly. It is also HERD's understanding that the request to close IWTP 360 is based on the soil meeting the RCRA requirements by the groundwater will be addressed under the Comprehensive Environmental Compensation Liability Act (CERCLA). If so, this seems to be a modification of RCRA Closure requirements. Please indicate whether or not HERD's understanding of the approach is accurate.

RESPONSE TO GENERAL COMMENT:

The deficiencies identified in the Human Health Risk Assessment (TtEMI, 2004) will be addressed and presented in a revised Technical Addendum to the HHRA. In addition, HERD's understanding regarding the Navy's request that groundwater at the site be addressed under CERCLA is correct. Since groundwater flows and commingles beyond IWTP 360, it is likely cost prohibitive to implement any RCRA corrective action on the groundwater while a more comprehensive basewide groundwater investigation is ongoing under the CERCLA program. Under Section 8 – Statutory Compliance/RCRA–CERCLA Integration, Federal Facility Agreement at Alameda Point between the Navy and regulatory agencies, it is stated that the Parties intend to integrate the Navy's CERCLA response obligations with RCRA corrective action obligations. Summarizing another statement in the section, the Parties intend that activities covered by this agreement will achieve compliance with CERCLA, satisfy correction action requirements of RCRA sections for a RCRA permit, for interim status facilities, and meet or exceed all applicable or relevant and appropriate Federal and State laws and regulations.

HERD Specific Comment 1: Table 1, Step 2: Identify the Decisions

This step should discuss the action and alternative action, e.g. no further action, further investigations, remediation, once the stated problem is addressed. The decision that is stated in this document seems to be more appropriate as the stated problem, i.e., it is unknown (a) if the target constituents in subsurface soils are present at concentrations that exceed the preliminary remediation goals (PRGs), (b) if the constituents in groundwater in the vicinity of IWT360 are present at concentrations that exceed the maximum contaminant levels (MCLs). Step 2 should identify the action if it is demonstrated that the subsurface soil constituents exceed the PRGs or if the chemical concentrations in groundwater exceed MCLs.

RESPONSE TO SPECIFIC COMMENT 1:

The intent of including the DQO table in the closure report was to reiterate the goals developed in the Sampling Plan for the Closure Confirmation Sampling (TtEMI, 2004). Although the table will not be revised, the Navy would like to clarify the proposed actions based on the findings of the confirmation sampling and risk assessment as follows: If it is determined that a corrective action on the soil is needed, RCRA corrective action will be conducted; if a corrective action is needed on the groundwater, it will be deferred to the CERCLA program, as previously stated.

HERD Specific Comment 2, Identification of Chemicals of Potential Concern (COPC), page 36:

HERD does not agree with the elimination of iron as a COPC because on-site activities were not considered to contribute iron to the environment. If iron was detected, and the highest concentration was not at or below the background level, then iron should be evaluated as a COPC.

HERD does not recommend the elimination of a chemical as a COPC based solely on a comparison to its corresponding preliminary remediation goal (PRG) value. The cumulative screening risk and/or hazard index should be presented, and the rationale for eliminating a specific chemical as a COPC should be discussed and agreed upon by DTSC.

RESPONSE TO SPECIFIC COMMENT 2:

Iron will no longer be eliminated based on the fact that site activities did not involve its use. Cited sections will be revised accordingly. As requested in specific comment 5, a new background evaluation will be completed for metals results, including iron, from the samples collected at the site. Those metals determined to be statistically greater than background will be considered a COPC, and will be included in the total risk calculations.

HERD Specific Comment 3, Section 8.2.1, 2nd paragraph, page 37:

The statement "EPA risk assessment guidance (1989) includes a preference for evaluation of the residential pathway" is inaccurate. Although the Risk Assessment Guidance for Superfund (EPA, 1989) states that residential land use is "generally the most conservative choice to make when deciding what type of alternate land use may occur in the future," the Guidance does state that future residential use may not be justified if it is unlikely that the site will support residential use. HERD recommends that this statement be restated that the evaluation of the residential scenario is intended to provide flexibility in the reuse plan rather than for compliance with EPA risk assessment guidance.

RESPONSE TO SPECIFIC COMMENT 3:
The statement will be revised as recommended.

HERD Specific Comment 4, Section 8.2.2, Estimation of Exposure Point Concentrations, page 38:

The human health risk assessment used soil data from 0 to 4 feet below ground surface (bgs) because soil data from 0 to 2 feet bgs is minimal. The potential exposures of a human receptor are delineated into surface soil and subsurface soil exposures. Surface soil is typically from surface to one-foot bgs, and subsurface soil extends to a depth of 10 feet bgs. If, as the report indicates, the surface soil data are minimal and do not justify the calculation of a 95% upper confidence limit (UCL), then HERD recommends that the maximum concentration detected between 0 to 1 foot bgs be used be to evaluate surface soil exposures.

RESPONSE TO SPECIFIC COMMENT 4:

The maximum values and 95% UCL values (as applicable) for the existing site soil data will be recalculated using the recommended depth intervals of 0-1 feet and 0-10 feet.

HERD Specific Comment 5, Section 8.4, page 41:

Please clarify that the total risk and hazard index estimates posed to an adult and child are calculated under the residential scenario only.

The incremental risk excludes, rather than includes, background metals. Based on recent internal discussions, HERD recommends a revised methodology for addressing background or ambient concentrations. If a detected chemical's maximum concentration is higher than its corresponding background or ambient level, then the chemical is not identified as a COPC. However, the background concentration is compared to its corresponding PRG in order to estimate its screening risk and hazard index. The background risk and/or hazard index are presented in the risk characterization along with the risk and/or hazard index due to the detected site concentrations in order to provide a perspective on the results of the risk assessment.

This report states that Section 8.4.2 presents the incremental risk for the residential scenario, and that Section 8.4.4 presents the health effects associated with lead exposure. Please correct the cited sections to Section 8.4.2.3 and 8.4.2, respectively.

RESPONSE TO SPECIFIC COMMENT 5:

Total risk and hazard index estimates are calculated for both adult and child under the residential exposure scenario only. The remaining exposure scenarios; future commercial/industrial worker, and future construction worker, include the calculation of total risk and hazard index estimates for adult exposures only.

COPCs will be re-evaluated/re-identified by comparing the site soil data to the Alameda Basewide Background data (see attachment for the proposed methodology for evaluating site data versus background data). Chemicals present at the site at concentrations consistent with background will not be included in the COPC list, but the concentrations will be compared to the PRGs; those site background concentrations that are above PRGs will be further evaluated and presented with the background risk. Cited sections will be revised accordingly.

HERD Specific Comment 6, Summary of Calculated Non-Carcinogenic Hazards, page 42:

Please clarify the following footnotes in this summary:

- Footnote (2) states that the incremental HI is mostly from potential exposure to metals in groundwater, but the HI due to groundwater exposure is not presented. Please present the HI due to groundwater.
- Footnote (2) also states that removing arsenic and manganese background levels results in an HI of 5.32 due to surface soils at the site. HERD notes that the incremental hazard index (HI) for residential surface soils is shown to be 10.1 (i.e., total HI of 18.2 less the background HI of 8.1). Therefore, the risk due to background levels was already taken into account in order to calculate the incremental HI. Hence, it is not appropriate to subtract, once again, the HI due to background levels of arsenic and manganese in order to reduce the HI to 5.32.

Rather than just stating that the incremental risk is from groundwater only, or that removing groundwater would result in reduced risk estimates, HERD recommends that the summary table presented in Section C3.0 of Appendix C be shown in Section 8.4.1 in order to provide a more comprehensive presentation of the risk and hazard index estimates. Without these values, the current summary tables do not clearly support the conclusions that groundwater is the primary contributor.

HERD recommends that the summary table be revised according to Specific Comment 5.

RESPONSE TO SPECIFIC COMMENT 6:

The summary table presented in Section C3.0 will be revised based on the new COPCs generated in response to Specific Comment 5. In addition, this revised summary table will be presented in Section 8.4.1. Cited footnotes will be clarified.

HERD Specific Comment 7, Section 8.4.1.2, Construction Worker Scenario, page 43:

The human health risk assessment did not evaluate the groundwater pathway. If the depth to groundwater ranges from 4.5 to 12 feet bgs, there is the possibility that a construction worker associated with redevelopment activities could come into contact with the shallow groundwater. HERD recommends that the risk assessment include an evaluation of potential exposure of construction worker to groundwater via incidental ingestion and dermal contact. The used of personal protective equipments (PPE) or other mitigating measures during construction activities can be discussed subsequently if the baseline risk estimates should indicate that the levels are unacceptable.

RESPONSE TO SPECIFIC COMMENT 7:

A pathway for construction worker for incidental ingestion of and dermal exposure to groundwater will be added and evaluated, though the Navy believes that incidental ingestion of groundwater by construction work is not a very realistic assumption.

HERD Specific Comment 8, Appendix C, Section C2.0:

Contrary to the last statement in Section C2.0, Table 2 in Appendix C presents the dermal absorption factors but does not present the exposure factors and toxicity values. Please revise either the statement in Section 2.0 or Table 2 for consistency.

RESPONSE TO SPECIFIC COMMENT 8:

The reference in the text should be to Table 1 not 2. The text will be revised.

HERD Specific Comment 9, Appendix C, Table 1:

Based on the conversion of the Reference Exposure Limit (REL) to a Reference Dose (RfD), the RfD for hexavalent chromium should be 5.7E-5 instead of 3E-3. Please correct the presented value. Furthermore, the values presented as inhalation reference concentrations are inhalation reference dose values. Please revise for accuracy.

RESPONSE TO SPECIFIC COMMENT 9:

The cited hexavalent chromium was a typo and will be corrected in the text; note that the correct value of 5.7E-5 was used in the calculations for hexavalent chromium. The cited references will be corrected on the table.

HERD Specific Comment 10, Appendix C, Table 3 and Table 6 in main body of the report:

Analytes with 95% UCL background concentrations higher than the 95% UCL site concentrations were identified as COPCs based on the frequency of detection. HERD does not agree with this approach. If an analyte has a site concentration that is at or lower than the corresponding concentration, then that analyte should not be identified as a COPC. The next step would be to compare the site concentrations to the USEPA Region IX and CalEPA-modified residential soil PRG in order to calculate a background risk or hazard index.

Based on this recommendation, aluminum, arsenic, cobalt, manganese, nickel, and vanadium should be eliminated from the list of soil COPCs.

RESPONSE TO SPECIFIC COMMENT 10:

In Specific Comment 5, HERD recommends a revised methodology for addressing background concentrations; thus, specific COPCs are being re-evaluated/re-identified based on the recalculated site soil data. In addition, each analyte will be identified or eliminated as a COPC in accordance with the above recommendations.

HERD Specific Comment 11, Appendix C, Risk and Hazard Calculations:

HERD spot-checked the risk and hazard calculations and has the following comments:

- The toxicity values were labeled as cancer slope factors (CSF)/Unit Risk. The risk associated with the inhalation pathway is either the product of the air concentrations (expressed in mg/m^3 or ug/m3) multiplied by the unit risk, or the product of the calculated dose multiplied by the inhalation slope factor. It is apparent that the risk estimates due to inhalation was conducted by multiplying the dose or intake with the inhalation slope factor, and the slope factors were used to estimate the risks due to the ingestion and dermal pathways. Therefore, HERD recommends that the term "unit risk" be deleted from the headings in the Table 7 series tables in order to avoid confusion.

  Similarly, the term reference concentration (RfC) should be deleted from the tables since it seems that the reference dose (RfD) was used to estimate the hazard due to the inhalation, ingestion, and dermal pathways.

- HERD's calculation risk estimates due to arsenic in soil at 0 – 4 feet are within the range of the presented risk estimates, but the risk estimates due to the inhalation and dermal pathways differ by at least an order of magnitude. HERD could not duplicate the inhalation and dermal risk estimates associated with the beryllium and cadmium in soil as well as the hazard quotients due to the ingestion pathway. HERD notes that the ingestion pathway is the primary contributor to the cumulative hazard index.

- The sources of the toxicity values that were updated should be identified in the footnotes of the tables.

RESPONSE TO SPECIFIC COMMENT 11:

- The references to "unit risk" and "reference concentration (RfC)" in the heading of the Table 7 series of tables will be deleted as recommended.

- The inhalation and dermal risk estimates for soil will be rechecked/recalculated and the tables updated as appropriate.

- The source of toxicity values will be included in the footnotes of the tables.

HERD Specific Comment 12, Figure C-6:

Based on Specific Comment 7, please indicate in the Conceptual Site Model that potential exposure of a construction worker to groundwater are potentially complete.

RESPONSE TO SPECIFIC COMMENT 12:

The Conceptual Site Model will be updated as recommended and included as a part of the Technical Addendum to the HHRA.

HERD Specific Comment 13, Tabulated Presentation of Risk and Hazard Index Estimates:

HERD recommends that the summary tables on page 42 and on pages C-2 and C-3 be revised for clarity, consistency, and accuracy. The Table 7 series shows the risk and hazard index calculations for the adult and child resident, the commercial/industrial worker, and the construction worker. The results presented in these tables are subsequently summarized in the Table 9 series. However, the values presented in the summary tables are inconsistent with the values presented in the calculation tables. In some cases, the discrepancies are due to the rounding off of figures but other seem to be due to insufficient internal review. The summary table on page 42 reflects the inconsistencies in the summary tables in Appendix C.

As an example, the total risk due to surface soil exposures of a child resident is shown to be 4.3E-05 (Appendix C, Table 9.1) but the summary table in Section C3.0 shows a total risk of 3E-05. The hazard index due to surface exposures of a child resident is shown to be 1.0 or 1.22 in Table 9.1 and 1.5 in the summary table of C3.0.

HERD recommends that the presented values be presented in a consistently manner throughout the document. If the values are to be rounded off to a certain number of significant figures, then this should be done throughout instead of showing values for the same scenario as 1 or 1.11 or 1.5. Additional revisions to the summary tables in Section C3.0 include the following:

- The primary contributors to the total risk due to residential exposures to surface soils are arsenic and cadmium instead of arsenic only.
- Vanadium is not a primary contributor to the hazard index due to groundwater exposures, and should be deleted from the list.

RESPONSE TO SPECIFIC COMMENT 13:

The series 7 Tables were updated using current DTSC values, however, no updates were done for the table 9 series. Thus, the governing risk tables are those updated tables provided as part of the Technical Addendum. The Table 9 series included as part of the TtEMI Risk Assessment are no longer directly applicable, and are included only because they are part of the referenced original document.

ATTACHMENT FOR
Response to HERD Specific Comment 5

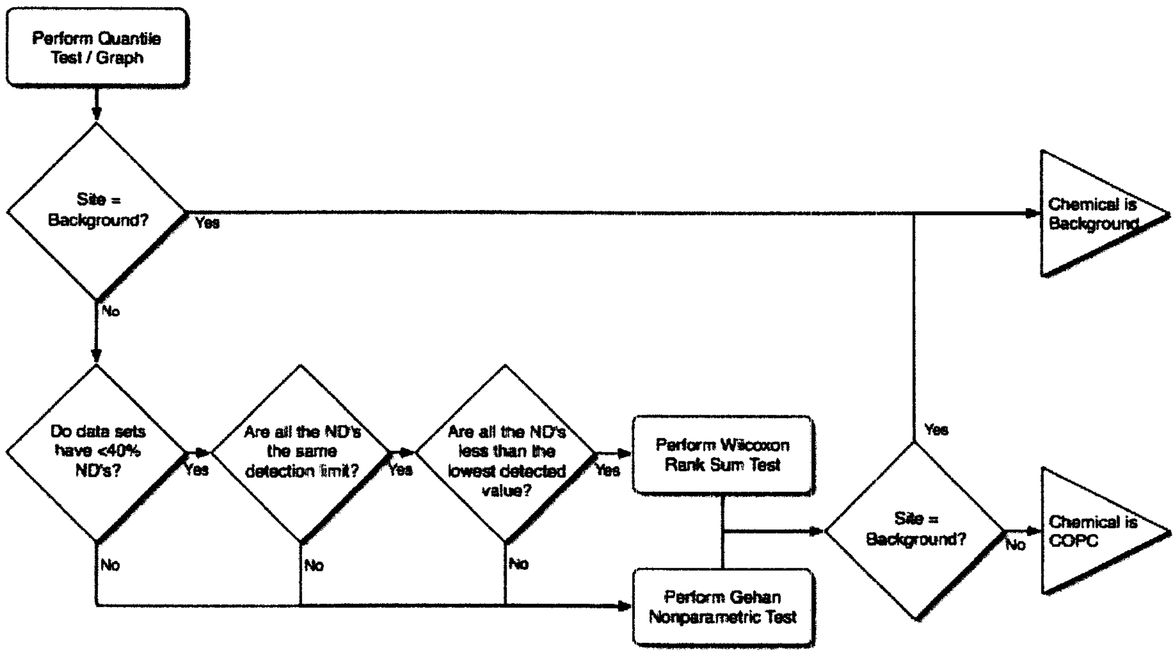
Procedure for Evaluating Site Chemical Data Against Background Data
IWTP360, Alameda Point, California

The site is located within the background area designated as "blue". The electronic data results were obtained from TtEMI that correspond to the samples used to develop the blue background data set, as identified in *Summary of Background Concentrations in Soil and Groundwater, Alameda Point*, by Tetra Tech EM Inc., dated December 2001.

As the constituents of interest are metals, and many of the metals include numerous non-detect values, comparison with background will center on a combination of graphical evaluations and nonparametric tests. A flow diagram of the proposed process is provided below:

An example analysis using the above process was performed for arsenic in soil, of particular interest at IWTP360.

Evaluating Site Data Against Background Data to Determine COPC

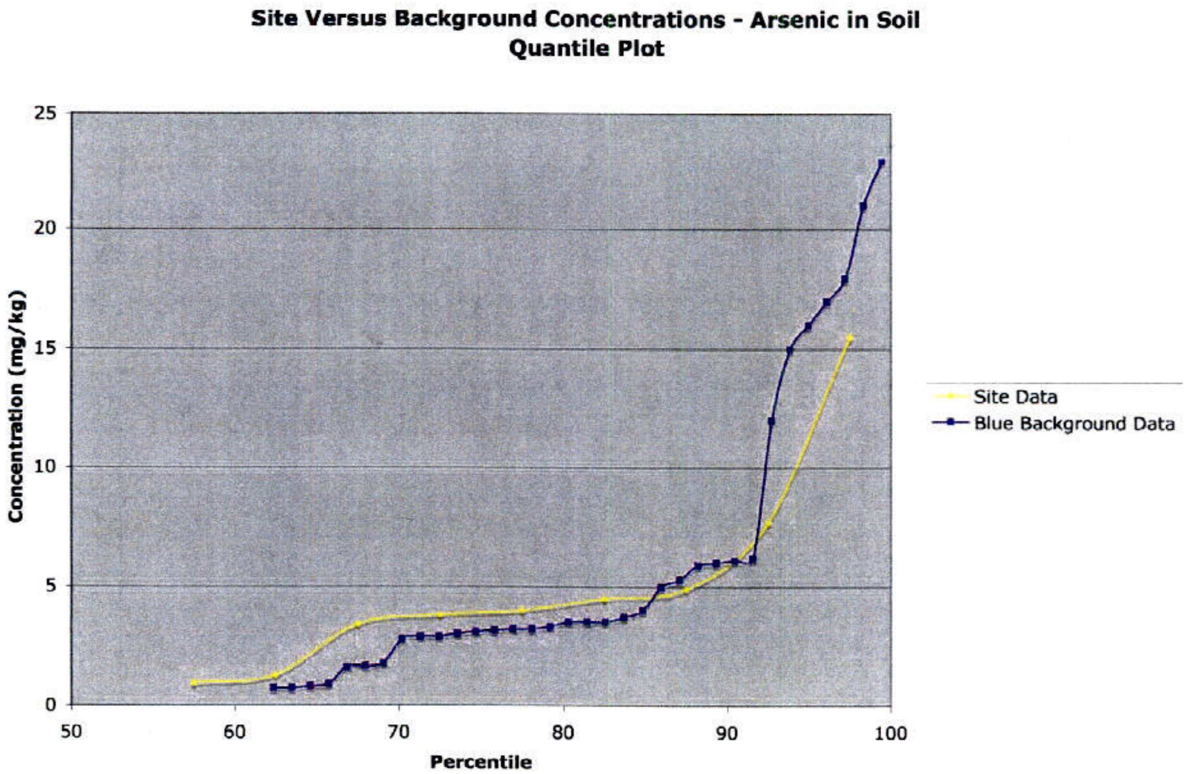


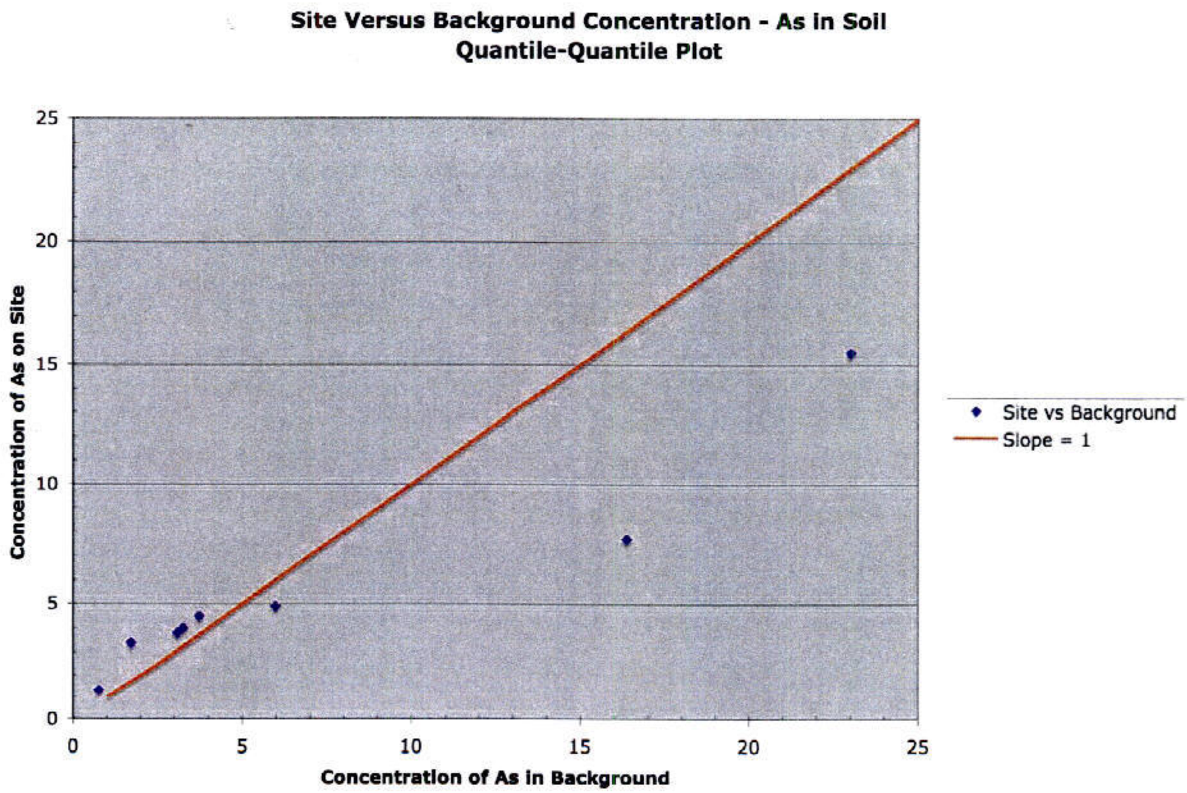
Basic Summary Statistics

Sample Set	No. Samples	No. NDs	% ND	Average (Detect Results)	Maximum
Blue Background	89	55	61.8%	6.19	23
Site Data	20	11	55.0%	5.12	15.5

Quantile Test / Graph

Several graphical methods were used to evaluate site versus background to determine the most efficient and effective method. Two approaches performed using excel on the raw data included a quantile plot and quantile-quantile plot comparing the blue background data to the site data, as shown below:





The results show quite clearly the site data falls well below background data in the higher concentration range. A quantile test was also performed on the data using ChemStat 6.1 (a software package designed specifically for evaluating chemical data for RCRA compliance). Results of this analysis indicated "*no statistical significance at 95% confidence level*".

Gehan Nonparametric Test

Due to the high percentage of NDs in the data set for arsenic in soil (greater than 50% for both background and site data sets), a Gehan Test was performed (again using ChemStat 6.1). The Gehan Statistic was 0.043, well below the criteria of 1.645, resulting in "*no statistical significance at 95% confidence level*". A copy of the output is provided below.

To validate these findings, given the high values found in the background data set, an outlier analysis was performed on the background data. Two potential outliers were identified. The site data passed the Gehan Test even after removing the potential outliers from the background data.

Gehan Non-Parametric Rank Test
Parameter: ARSENIC

Gehan Ranks

Point	Date	Result	d - e	Rank	a(R)
033-IWTP360-024	1/1/2000	ND<0.35	0 - 1	33.5	-43
B16-11	8/20/1998	ND<0.61 U	0 - 2	33.5	-43
B16-10	8/20/1998	ND<0.66 U	0 - 3	33.5	-43
B16-11	8/20/1998	ND<0.7 U	0 - 4	33.5	-43
M09-05	11/6/1998	ND<0.71 U	0 - 5	33.5	-43
B16-10	8/20/1998	ND<0.72 U	0 - 6	33.5	-43
M16-04	11/8/1998	0.74 J	1 - 6	37	-36
M16-04	11/8/1998	0.74 J	2 - 6	38	-34
B16-11	8/20/1998	ND<0.79 U	2 - 7	34.5	-41
B16-10	8/20/1998	ND<0.8 U	2 - 8	34.5	-41
M09-05	11/6/1998	0.84 J	3 - 8	40	-30
B16-12	8/20/1998	ND<0.88 U	3 - 9	35	-40
134-0014	1/1/2000	ND<0.88	3 - 10	35	-40
M09-05	11/6/1998	0.92 J	4 - 10	42	-26
134-0014M	1/1/2000	0.94	5 - 10	43	-24
033-IWTP360-019	1/1/2000	ND<1	5 - 11	36	-38
B16-12	8/20/1998	ND<1.2 U	5 - 12	36	-38
033-IWTP360-004	1/1/2000	ND<1.2	5 - 13	36	-38
134-0015M	1/1/2000	1.3	6 - 13	45.5	-19
B16-10	8/20/1998	ND<1.3 U	6 - 14	36.5	-37
033-IWTP360-003	1/1/2000	ND<1.4	6 - 15	36.5	-37
B16-12	8/20/1998	ND<1.4 U	6 - 16	36.5	-37
033-IWTP360-013	1/1/2000	ND<1.4	6 - 17	36.5	-37
B07C-11	8/18/1998	ND<1.5 U	6 - 18	36.5	-37
033-IWTP360-035	1/1/2000	ND<1.5	6 - 19	36.5	-37
MBG-3	5/30/1996	1.63	7 - 19	49.5	-11
MBG-3	5/30/1996	1.68	8 - 19	50.5	-9
033-IWTP360-001	1/1/2000	ND<1.7	8 - 20	37.5	-35
MBG-3	5/30/1996	1.8	9 - 20	52	-6
B07C-11	8/18/1998	ND<1.9 U	9 - 21	38	-34
B07C-11	8/18/1998	ND<1.9 U	9 - 22	38	-34
033-IWTP360-012	1/1/2000	ND<1.9	9 - 23	38	-34
MW410-1	7/2/1994	ND<1.9 U	9 - 24	38	-34
033-IWTP360-034	1/1/2000	ND<2	9 - 25	38	-34
B07C-12	8/18/1998	ND<2 U	9 - 26	38	-34
MW410-1	7/2/1994	ND<2.2 U	9 - 27	38	-34
033-IWTP360-021	1/1/2000	ND<2.3	9 - 28	38	-34
MW410-4	7/13/1994	ND<2.4 U	9 - 29	38	-34
MW410-1	7/2/1994	ND<2.4 U	9 - 30	38	-34
B410-9	7/13/1994	ND<2.4 U	9 - 31	38	-34
MW547-1	6/30/1994	ND<2.5 U	9 - 32	38	-34
MW410-4	7/13/1994	ND<2.5 U	9 - 33	38	-34
MW547-2	6/30/1994	ND<2.5 U	9 - 34	38	-34
MW547-1	6/30/1994	ND<2.5 U	9 - 35	38	-34
MW410-3	7/13/1994	ND<2.6 U	9 - 36	38	-34
B410-7	7/13/1994	ND<2.6 U	9 - 37	38	-34
MW547-2	6/30/1994	ND<2.7 U	9 - 38	38	-34
MW547-2	6/30/1994	ND<2.7 U	9 - 39	38	-34
MW547-1	6/30/1994	ND<2.8 U	9 - 40	38	-34
MW410-3	7/13/1994	ND<2.8 U	9 - 41	38	-34
MW547-1	6/30/1994	ND<2.8 U	9 - 42	38	-34
MW547-2	6/30/1994	ND<2.8 U	9 - 43	38	-34
MW410-4	7/13/1994	ND<2.8 U	9 - 44	38	-34
MW410-1	7/2/1994	2.8	10 - 44	65	20
MW410-3	7/13/1994	2.9	11 - 44	66	22
MW410-4	7/13/1994	ND<2.9 U	11 - 45	39	-32

Gehan Ranks

Point	Date	Result	d - e	Rank	a(R)
MW410-3	7/13/1994	ND<2.9 U	11 - 46	39	-32
MW547-2	6/30/1994	2.9	12 - 46	68	26
MW410-3	7/13/1994	ND<2.9 U	12 - 47	39.5	-31
B410-7	7/13/1994	ND<3 U	12 - 48	39.5	-31
MW410-4	7/13/1994	ND<3 U	12 - 49	39.5	-31
B410-9	7/13/1994	ND<3 U	12 - 50	39.5	-31
MW547-1	6/30/1994	3	13 - 50	71	32
B410-9	7/13/1994	ND<3.1 U	13 - 51	40	-30
MW410-1	7/2/1994	3.1	14 - 51	72.5	35
MBG-3	5/30/1996	3.14	15 - 51	73.5	37
MW547-2	6/30/1994	3.2	16 - 51	74.5	39
B410-7	7/13/1994	3.2	17 - 51	75.5	41
B410-7	7/13/1994	3.3	18 - 51	76.5	43
033-IWTP360-015	1/1/2000	3.4	19 - 51	77.5	45
MW547-1	6/30/1994	3.5	20 - 51	78.5	47
MW410-1	7/2/1994	3.5	21 - 51	79.5	49
B410-9	7/13/1994	3.5	22 - 51	80.5	51
MW410-3	7/13/1994	3.7	23 - 51	81.5	53
033-IWTP360-018	1/1/2000	3.8	24 - 51	82.5	55
MW410-4	7/13/1994	4	25 - 51	83.5	57
033-IWTP360-022	1/1/2000	4	26 - 51	84.5	59
033-IWTP360-027	1/1/2000	4.5	27 - 51	85.5	61
033-IWTP360-028	1/1/2000	4.9	28 - 51	86.5	63
B410-7	7/13/1994	5	29 - 51	87.5	65
MW547-2	6/30/1994	5.3	30 - 51	88.5	67
B410-9	7/13/1994	5.9	31 - 51	89.5	69
B410-9	7/13/1994	6	32 - 51	90.5	71
B410-7	7/13/1994	6.1	33 - 51	91.5	73
MW410-1	7/2/1994	6.2	34 - 51	92.5	75
033-IWTP360-025	1/1/2000	7.7	35 - 51	93.5	77
B547-6	7/3/1994	ND<10 U	35 - 52	51	-8
MWC2-3	7/26/1994	ND<11 U	35 - 53	51	-8
B547-10	7/3/1994	ND<11 U	35 - 54	51	-8
BC2-7	7/25/1994	ND<12 U	35 - 55	51	-8
B547-10	7/3/1994	12	36 - 55	96.5	83
MWC2-3	7/26/1994	ND<12 U	36 - 56	51.5	-7
MWC2-3	7/26/1994	ND<12 U	36 - 57	51.5	-7
B547-6	7/3/1994	ND<12 U	36 - 58	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 59	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 60	51.5	-7
B547-10	7/3/1994	ND<12 U	36 - 61	51.5	-7
B547-6	7/3/1994	ND<12 U	36 - 62	51.5	-7
MWC2-3	7/26/1994	ND<12 U	36 - 63	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 64	51.5	-7
MWC2-3	7/26/1994	ND<13 U	36 - 65	51.5	-7
MWC2-3	7/26/1994	ND<13 U	36 - 66	51.5	-7
B547-6	7/3/1994	15	37 - 66	103	96
033-IWTP360-002	1/1/2000	15.5	38 - 66	104	98
B547-6	7/3/1994	16	39 - 66	105	100
B547-6	7/3/1994	17	40 - 66	106	102
B547-10	7/3/1994	18	41 - 66	107	104
B547-10	7/3/1994	21	42 - 66	108	106
B547-10	7/3/1994	23	43 - 66	109	108

Gehan Numerator = 8, Gehan Denominator Sum = 226908, Gehan Denominator = 185.229, Gehan Statistic = 0.0431897

Z = 1.64485 at 95% level of significance

0.0431897 < 1.64485

No Statistical Significance at 95% Confidence Level

RESPONSE TO DTSC COMMENTS ON THE NAVY'S RESPONSE TO DTSC'S FIRST SET OF COMMENTS ON:

Draft Amendment Closure Summary Report (dated March 2006) Industrial Waste Treatment Plant 360, Alameda Point, Alameda, CA

DTSC Review Comments dated October 27, 2006 from Buck King, PG, CHG, Engineering Geologist, and Brian Lewis, CHG, CEG, Senior Engineering Geologist, Geology, Permitting, and Corrective Action Branch, Hazardous Waste Management Program

Specific Comments and Recommendation 1:
The GSU Recommended that the soil characterization data presented in the Closure Summary Report be re-organized to present conditions in the 0 to 2 foot depth range, and the 0 to 10 foot depth range, in order to support risk assessment evaluation. The revised evaluation should include a statistical comparison of site soil data to background soil data. Instances where statistical comparison can not be made due to insufficient data or censored data should be noted.

The Navy response to GSU Recommendation 1 was that the existing soil characterization data will be used to identify either the maximum value or the 95% Upper Confidence Limit using Human and Ecological Risk Division (HERD) recommended depth intervals of 0 to 1 foot and 0 to 10 feet.

The Navy response to GSU Recommendation 1 did not specifically describe how the revised document would address soil background inorganic data evaluation or the completeness and appropriateness of soil background inorganic dataset. The GSU considers the Navy's response to be incomplete and silent on the issue of soil background chemistry data source and its appropriateness for use at IWTP 360.

RESPONSE TO COMMENT 1:
The Navy provided specific descriptions and examples of how the soil background data would be re-evaluated with the RTC to HERD's Specific Comment 5 that were included along with GSU's RTCs. This attachment is provided again for your reference.

Specific Comments and Recommendation 2:
The GSU recommends that groundwater data used to characterize the site include the results from well M04-05. The well M04-05 is approximately 30 feet down gradient of the vitrified clay pipe lines associated with IWTP 360, and is considered representative of groundwater conditions associated with the regulated unit. The revised report should include a revised statistical evaluation of site groundwater data compared to background groundwater data.

The Navy response to GSU Recommendation 2 was that data from well M04-05 should not be included in the characterization of the IWTP 360 because M04-05 is included in an ongoing base-wide groundwater investigation under the CERCLA program.

The GSU considers the Navy's response incomplete and silent on the issue of statistically evaluating groundwater inorganic chemistry data and comparing it to background data. The GSU is interested in inorganic chemistry results including lead, copper, cadmium, total chromium, and hexavalent chromium data. The GSU does not agree with the argument that the CERCLA administrative program precludes the use of data from well M04-05. The data from well M04-05 will support the understanding groundwater chemical conditions in the IWTP 360 area. The GSU does not agree with the Closure Summary Report interpretations that cadmium and hexavalent chromium levels in groundwater beneath IWTP 360 are the result of background conditions the GUS is interested in the basis for interpreted background levels and in the Navy's interpretation of groundwater conditions in the IWTP 360 area.

RESPONSE TO COMMENT 2:
The GSU comments suggests results for monitoring well MW04-05 are "considered representative of groundwater conditions associated with the regulated unit". The Navy disagrees with this assertion; rather the Navy considers the results for MW04-05 representative of Building 360 located upgradient of MW04-05 and IR Site 3 Group rather than the regulated unit.

Recent results from the spring 2006 groundwater monitoring performed as part of the Alameda Basewide Annual Groundwater Monitoring Program (conducted under CERCLA) revealed chromium concentrations in groundwater of 21,000 ug/L from the second water bearing zone downgradient from Building 360 (monitoring well D03-03) but cross-gradient of the regulated unit. This supports the presence of a chromium source associated with Building 360 that would account for the chromium reported in MW04-05.

The Navy does not suggest the CERCLA administrative program precludes the use of data from well M04-05, rather, the Navy believes the results for MW04-05 are not representative of the regulated unit and its inclusion in the risk assessment may overstate the groundwater risks specifically associated with the regulated unit.

As indicated in Response to Comment 1 above, guidelines for evaluating site data versus background were provided as part of the response to HERD's Comment 5 (attached). This evaluation will be performed for the site groundwater results.

Specific Comments and Recommendation 3:
Recommendations. The GSU reiterates it previous recommendation that the soil characterization data presented in the Closure Summary Report is reorganized to support risk assessment evaluation. The revised evaluation should include a statistical comparison of site soil data to

background soil data. Instances where statistical comparison can not be made due to insufficient data or censored data should be noted.

The GSU also reiterates it previous recommendation that groundwater data used to characterize the site includes the results from well MW04-05. The Closure Summary Report should be revised to include an amended statistical evaluation of site groundwater data, including a comparison to background groundwater data, and be resubmitted to the Department for GSU review.

RESPONSE TO COMMENT 3:
As previously stated, a new background evaluation of the soil data is being performed using both graphical and numerical techniques, and the results will be used to update the chemicals of potential concern (COPC) for the site, and then in calculating the exposure point concentrations (EPCs) for the COPCs.

The Navy also reiterates its position that groundwater data from well M04-05 should not be included in the characterization of the regulated unit, but rather considered as part of the ongoing CERCLA activities relating to Building 360 and IR Site 3 Group, including the basewide long-term groundwater monitoring program and the upcoming remedial design data gap investigation for IR Site Group 3. Both of these CERCLA activities involve groundwater data collection and contaminant delineation that would lead to appropriate groundwater remedial actions. Coupled with the RCRA/CERCLA integration per the FFA, addressing M04-05 under the ongoing CERCLA actions is appropriate.

ATTACHMENT FOR
Response to the September 11, 2006
HERD Specific Comment 5

RESPONSE TO HERD'S COMMENTS ON THE NAVY'S RESPONSE TO DTSC'S FIRST SET OF HERD COMMENTS ON:

Draft Amendment Closure Summary Report (dated March 2006) Industrial Waste Treatment Plant (IWTP) 360, Alameda Point, Alameda, CA

Review Comments dated October 25, 2006 from Riz A. Sarmiento, Ph.D., Staff Toxicologist, Human and Ecological Risk Division.

Specific Comments and Recommendation 1:
Presentation of Risk and Hazard Index Estimates. The results of the human health risk assessment indicated that, under an assumed residential scenario, the carcinogenic risk estimates due to potential soil exposures are above 1E-05 but below 1E-04. Since the requested closure for IWTP 360 seems to be partly based on the background soil posing a higher risk and hazard index than the site soils, it is important that the background soil data set presented by the Navy are acceptable, and that the statistical calculations are valid. The risk assessment indicates that the contributors to the cumulative risk and hazard index were the inorganic constituents, hence, the human health risk assessment presented incremental risk and hazard index as the difference between the risk/hazard index due to the site and the risk/hazard index due to background or ambient levels. HERD's recommendation is to present separately the risks due to the site and the risks due to background. If the statistical calculations for calculating the site and the ambient concentrations of inorganic constituents were based on similar methodologies, e.g., site UCL vs. ambient UCL or site UTL vs. ambient UTL, then the incremental risks due to the releases from the site could be presented as the difference between the site and ambient risks. Otherwise, the risks due to the site and ambient levels should be presented without any attempts to present the incremental risks. HERD then recommends that the DTSC will based its risk management decision on an evaluation of the two data sets.

RESPONSE TO COMMENT 1:
Based on HERD comment, separate risks for the site and for background will be calculated, with the site risk calculations considering just the COPCs identified from the background evaluation.

EPCs will be calculated for the COPCs using the available site data. EPCs for metals considered background will be the basewide background results from the December 2001 study.

Specific Comments and Recommendation 2:
Groundwater Evaluation. The revised health risk assessment should also present a valid rationale for excluding hexavalent chromium as a chemical of potential concern (COPC) in groundwater.

The Navy also indicated that groundwater is not a likely source of potable water, hence, the unacceptable risk and hazard index estimates due to ingestion of drinking water do not represent the actual use of groundwater at the site. Groundwater beneath Alameda Point is currently classified by the SWRCB as potentially suitable for municipal or dolmestic supply and is a Class II aquifer (current or potential source of drinking water). However, because of the brackish nature of the groundwater, the Board has acknowledged that it is unlikely that the groundwater will ever be used as a drinking water source. Nevertheless, MCLs still apply because the groundwater is classified as a Class II aquifer. HERD recommends that the Navy acknowledge that the groundwater meets the definition of the Class II aquifer but states that is unlikely to be used as a drinking water source.

The Navy is proposing to address soil closure under RCRA and groundwater closure under CERCLA. HERD defers to the Geological Services Unit (GSU) for concurrence that the extent of soil contamination at IWTP 360 has been adequately characterized. If GSU should concur that the soil data within these boundaries are sufficiently characterized, then HERD concurs that the result of the soil risk assessment could support soil closure of IWTP 360. HERD also defers to GSU for concurrence that the groundwater data used in the human health risk assessment represent groundwater conditions at IWTP 360, both for background and for the site since, as stated by the Navy, groundwater flows and commingles beyond IWTP 360.

HERD recommends that the site boundaries for IWTP 360 be clearly delineated. HERD also defers to the Standardized Permitting and Corrective Action Branch management regarding any deferral of cleanup of groundwater under IWTP-360 to the CERCLA program.

RESPONSE TO COMMENT 2:
Hexavalent chromium in groundwater will be specifically re-evaluated relative to background as part of the revised background evaluation.

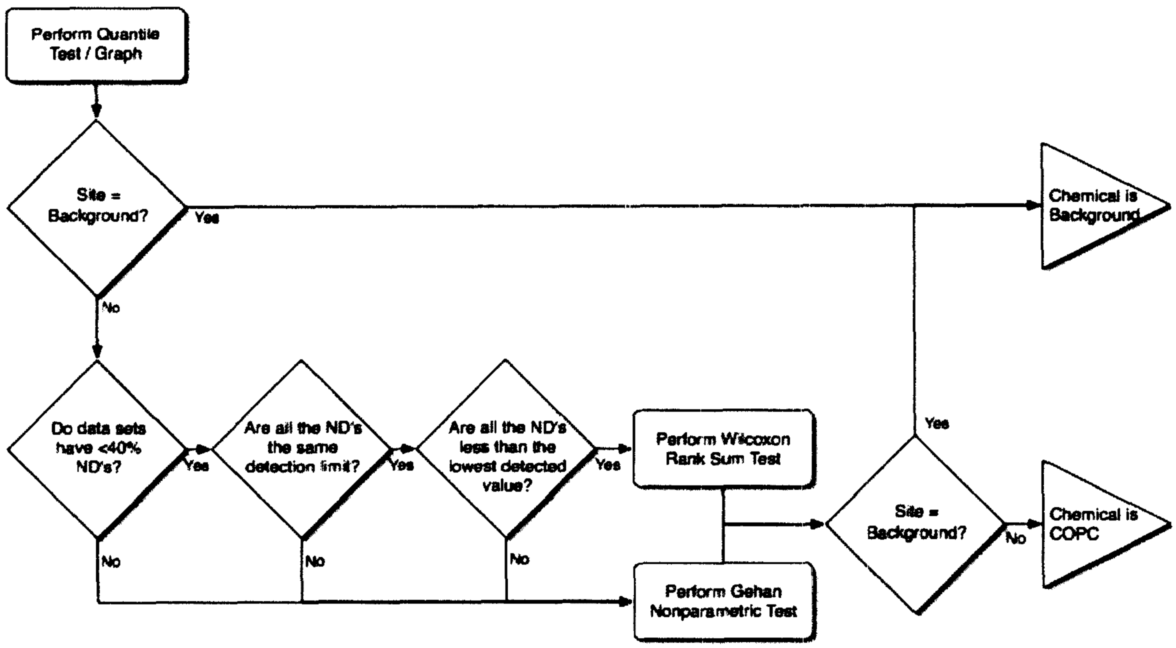
Procedure for Evaluating Site Chemical Data Against Background Data
IWTP360, Alameda Point, California

The site is located within the background area designated as "blue". The electronic data results were obtained from TtEMI that correspond to the samples used to develop the blue background data set, as identified in *Summary of Background Concentrations in Soil and Groundwater, Alameda Point*, by Tetra Tech EM Inc., dated December 2001.

As the constituents of interest are metals, and many of the metals include numerous non-detect values, comparison with background will center on a combination of graphical evaluations and nonparametric tests. A flow diagram of the proposed process is provided below:

An example analysis using the above process was performed for arsenic in soil, of particular interest at IWTP360.

Evaluating Site Data Against Background Data to Determine COPC



Basic Summary Statistics

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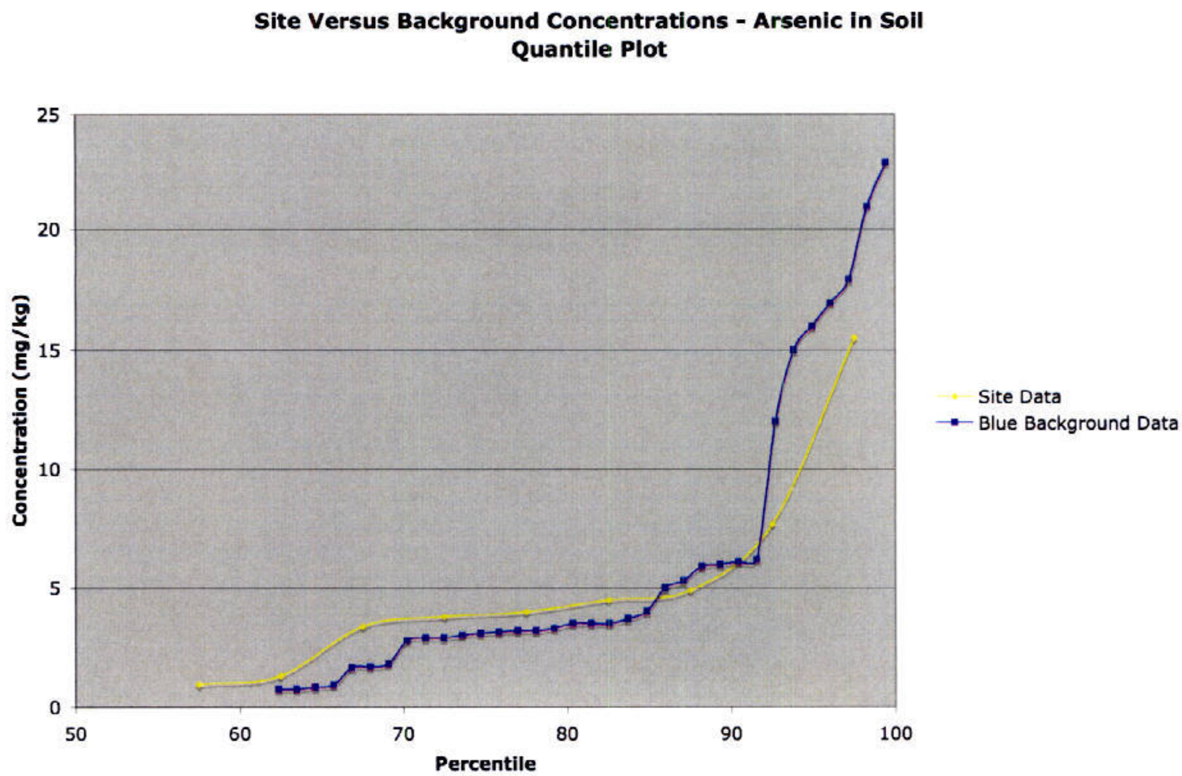

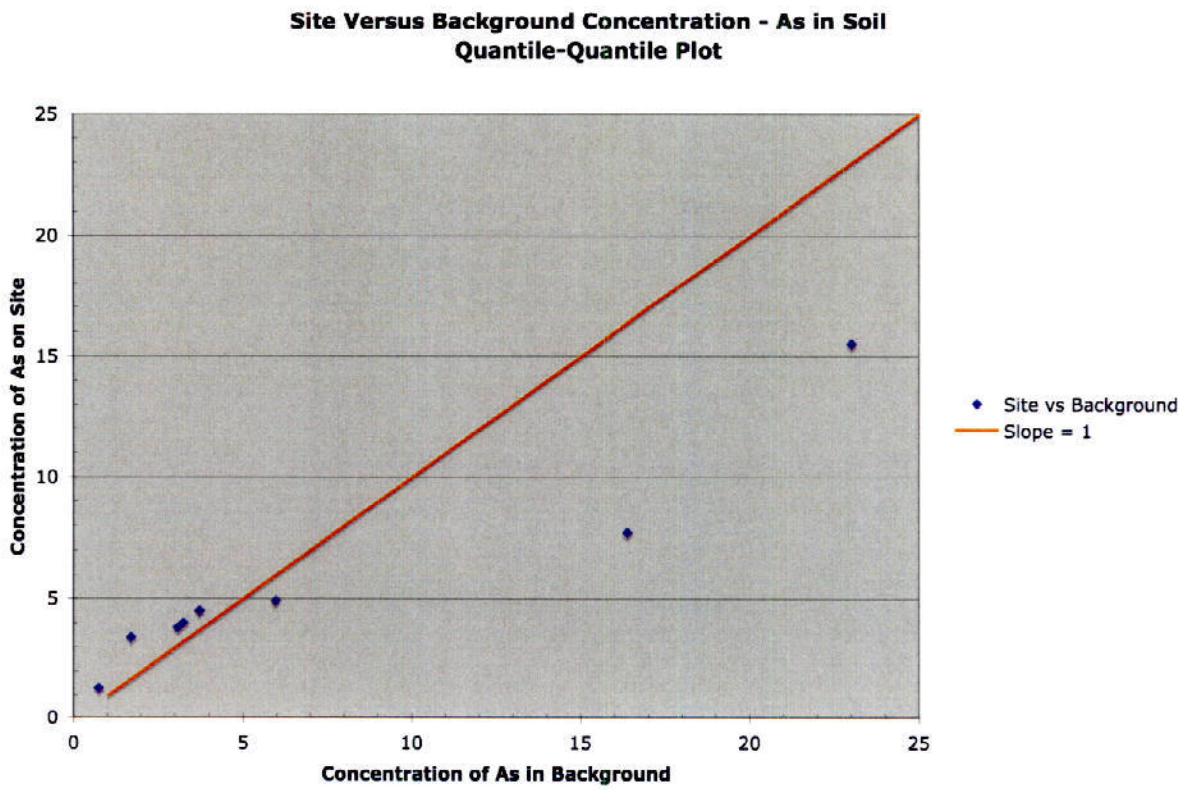

The results show quite clearly the site data falls well below background data in the higher concentration range. A quantile test was also performed on the data using ChemStat 6.1 (a software package designed specifically for evaluating chemical data for RCRA compliance). Results of this analysis indicated "*no statistical significance at 95% confidence level*".

Gehan Nonparametric Test

Due to the high percentage of NDs in the data set for arsenic in soil (greater than 50% for both background and site data sets), a Gehan Test was performed (again using ChemStat 6.1). The Gehan Statistic was 0.043, well below the criteria of 1.645, resulting in "*no statistical significance at 95% confidence level*". A copy of the output is provided below.

To validate these findings, given the high values found in the background data set, an outlier analysis was performed on the background data. Two potential outliers were identified. The site data passed the Gehan Test even after removing the potential outliers from the background data.

Gehan Non-Parametric Rank Test
Parameter: ARSENIC

Gehan Ranks

Point	Date	Result	d - e	Rank	a(R)
033-IWTP360-024	1/1/2000	ND<0.35	0 - 1	33.5	-43
B16-11	8/20/1998	ND<0.61 U	0 - 2	33.5	-43
B16-10	8/20/1998	ND<0.66 U	0 - 3	33.5	-43
B16-11	8/20/1998	ND<0.7 U	0 - 4	33.5	-43
M09-05	11/6/1998	ND<0.71 U	0 - 5	33.5	-43
B16-10	8/20/1998	ND<0.72 U	0 - 6	33.5	-43
M16-04	11/8/1998	0.74 J	1 - 6	37	-36
M16-04	11/8/1998	0.74 J	2 - 6	38	-34
B16-11	8/20/1998	ND<0.79 U	2 - 7	34.5	-41
B16-10	8/20/1998	ND<0.8 U	2 - 8	34.5	-41
M09-05	11/6/1998	0.84 J	3 - 8	40	-30
B16-12	8/20/1998	ND<0.88 U	3 - 9	35	-40
134-0014	1/1/2000	ND<0.88	3 - 10	35	-40
M09-05	11/6/1998	0.92 J	4 - 10	42	-26
134-0014M	1/1/2000	0.94	5 - 10	43	-24
033-IWTP360-019	1/1/2000	ND<1	5 - 11	36	-38
B16-12	8/20/1998	ND<1.2 U	5 - 12	36	-38
033-IWTP360-004	1/1/2000	ND<1.2	5 - 13	36	-38
134-0015M	1/1/2000	1.3	6 - 13	45.5	-19
B16-10	8/20/1998	ND<1.3 U	6 - 14	36.5	-37
033-IWTP360-003	1/1/2000	ND<1.4	6 - 15	36.5	-37
B16-12	8/20/1998	ND<1.4 U	6 - 16	36.5	-37
033-IWTP360-013	1/1/2000	ND<1.4	6 - 17	36.5	-37
B07C-11	8/18/1998	ND<1.5 U	6 - 18	36.5	-37
033-IWTP360-035	1/1/2000	ND<1.5	6 - 19	36.5	-37
MBG-3	5/30/1996	1.63	7 - 19	49.5	-11
MBG-3	5/30/1996	1.68	8 - 19	50.5	-9
033-IWTP360-001	1/1/2000	ND<1.7	8 - 20	37.5	-35
MBG-3	5/30/1996	1.8	9 - 20	52	-6
B07C-11	8/18/1998	ND<1.9 U	9 - 21	38	-34
B07C-11	8/18/1998	ND<1.9 U	9 - 22	38	-34
033-IWTP360-012	1/1/2000	ND<1.9	9 - 23	38	-34
MW410-1	7/2/1994	ND<1.9 U	9 - 24	38	-34
033-IWTP360-034	1/1/2000	ND<2	9 - 25	38	-34
B07C-12	8/18/1998	ND<2 U	9 - 26	38	-34
MW410-1	7/2/1994	ND<2.2 U	9 - 27	38	-34
033-IWTP360-021	1/1/2000	ND<2.3	9 - 28	38	-34
MW410-4	7/13/1994	ND<2.4 U	9 - 29	38	-34
MW410-1	7/2/1994	ND<2.4 U	9 - 30	38	-34
B410-9	7/13/1994	ND<2.4 U	9 - 31	38	-34
MW547-1	6/30/1994	ND<2.5 U	9 - 32	38	-34
MW410-4	7/13/1994	ND<2.5 U	9 - 33	38	-34
MW547-2	6/30/1994	ND<2.5 U	9 - 34	38	-34
MW547-1	6/30/1994	ND<2.5 U	9 - 35	38	-34
MW410-3	7/13/1994	ND<2.6 U	9 - 36	38	-34
B410-7	7/13/1994	ND<2.6 U	9 - 37	38	-34
MW547-2	6/30/1994	ND<2.7 U	9 - 38	38	-34
MW547-2	6/30/1994	ND<2.7 U	9 - 39	38	-34
MW547-1	6/30/1994	ND<2.8 U	9 - 40	38	-34
MW410-3	7/13/1994	ND<2.8 U	9 - 41	38	-34
MW547-1	6/30/1994	ND<2.8 U	9 - 42	38	-34
MW547-2	6/30/1994	ND<2.8 U	9 - 43	38	-34
MW410-4	7/13/1994	ND<2.8 U	9 - 44	38	-34
MW410-1	7/2/1994	2.8	10 - 44	65	20
MW410-3	7/13/1994	2.9	11 - 44	66	22
MW410-4	7/13/1994	ND<2.9 U	11 - 45	39	-32

Gehan Ranks

Point	Date	Result	d - e	Rank	a(R)
MW410-3	7/13/1994	ND<2.9 U	11 - 46	39	-32
MW547-2	6/30/1994	2.9	12 - 46	68	26
MW410-3	7/13/1994	ND<2.9 U	12 - 47	39.5	-31
B410-7	7/13/1994	ND<3 U	12 - 48	39.5	-31
MW410-4	7/13/1994	ND<3 U	12 - 49	39.5	-31
B410-9	7/13/1994	ND<3 U	12 - 50	39.5	-31
MW547-1	6/30/1994	3	13 - 50	71	32
B410-9	7/13/1994	ND<3.1 U	13 - 51	40	-30
MW410-1	7/2/1994	3.1	14 - 51	72.5	35
MBG-3	5/30/1996	3.14	15 - 51	73.5	37
MW547-2	6/30/1994	3.2	16 - 51	74.5	39
B410-7	7/13/1994	3.2	17 - 51	75.5	41
B410-7	7/13/1994	3.3	18 - 51	76.5	43
033-IWTP360-015	1/1/2000	3.4	19 - 51	77.5	45
MW547-1	6/30/1994	3.5	20 - 51	78.5	47
MW410-1	7/2/1994	3.5	21 - 51	79.5	49
B410-9	7/13/1994	3.5	22 - 51	80.5	51
MW410-3	7/13/1994	3.7	23 - 51	81.5	53
033-IWTP360-018	1/1/2000	3.8	24 - 51	82.5	55
MW410-4	7/13/1994	4	25 - 51	83.5	57
033-IWTP360-022	1/1/2000	4	26 - 51	84.5	59
033-IWTP360-027	1/1/2000	4.5	27 - 51	85.5	61
033-IWTP360-028	1/1/2000	4.9	28 - 51	86.5	63
B410-7	7/13/1994	5	29 - 51	87.5	65
MW547-2	6/30/1994	5.3	30 - 51	88.5	67
B410-9	7/13/1994	5.9	31 - 51	89.5	69
B410-9	7/13/1994	6	32 - 51	90.5	71
B410-7	7/13/1994	6.1	33 - 51	91.5	73
MW410-1	7/2/1994	6.2	34 - 51	92.5	75
033-IWTP360-025	1/1/2000	7.7	35 - 51	93.5	77
B547-6	7/3/1994	ND<10 U	35 - 52	51	-8
MWC2-3	7/26/1994	ND<11 U	35 - 53	51	-8
B547-10	7/3/1994	ND<11 U	35 - 54	51	-8
BC2-7	7/25/1994	ND<12 U	35 - 55	51	-8
B547-10	7/3/1994	12	36 - 55	96.5	83
MWC2-3	7/26/1994	ND<12 U	36 - 56	51.5	-7
MWC2-3	7/26/1994	ND<12 U	36 - 57	51.5	-7
B547-6	7/3/1994	ND<12 U	36 - 58	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 59	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 60	51.5	-7
B547-10	7/3/1994	ND<12 U	36 - 61	51.5	-7
B547-6	7/3/1994	ND<12 U	36 - 62	51.5	-7
MWC2-3	7/26/1994	ND<12 U	36 - 63	51.5	-7
BC2-7	7/25/1994	ND<12 U	36 - 64	51.5	-7
MWC2-3	7/26/1994	ND<13 U	36 - 65	51.5	-7
MWC2-3	7/26/1994	ND<13 U	36 - 66	51.5	-7
B547-6	7/3/1994	15	37 - 66	103	96
033-IWTP360-002	1/1/2000	15.5	38 - 66	104	98
B547-6	7/3/1994	16	39 - 66	105	100
B547-6	7/3/1994	17	40 - 66	106	102
B547-10	7/3/1994	18	41 - 66	107	104
B547-10	7/3/1994	21	42 - 66	108	106
B547-10	7/3/1994	23	43 - 66	109	108

Gehan Numerator = 8, Gehan Denominator Sum = 226908, Gehan Denominator = 185.229, Gehan Statistic = 0.0431897
Z = 1.64485 at 95% level of significance
0.0431897 < 1.64485
No Statistical Significance at 95% Confidence Level